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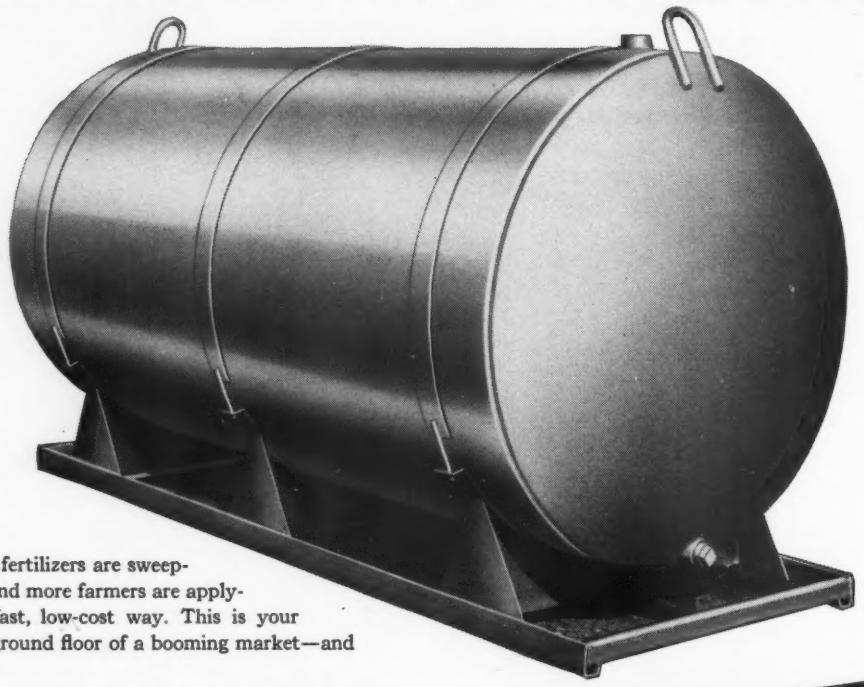

Welded low-pressure skid tank for on-farm storage. Available in 500, 830 and 1000-gallon capacities. Others (without skids) from 100 to 1000 gallons.

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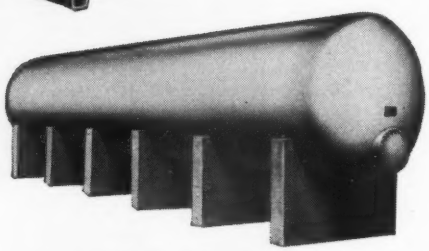
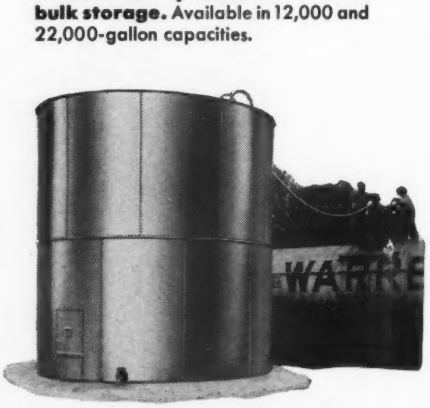


Welded low-pressure tank for bulk storage. Available in 12,000 and 22,000-gallon capacities.



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Cover Story

Unhealthy fruit and scaly leaves resulting from apple scab are examined by Dr. H. Douglas Tate, director of U. S. Rubber's Bethany Laboratories, site of Naugatuck Chemical agricultural research.

Vol. 117 AUGUST, 1954 No. 8

Contents

In this issue . . .

Members of the Pacific Branch, ESA heard a number of excellent papers presented at their recent Bend, Ore., meeting. The affair is well reported by Chuck Starker beginning on page 25.

Liberty Mfg. Co., Red Springs, N. C., seems to be a most progressive outfit judging by its customer relations program, liquid nitrogen marketing, airplane application work and other features. See page 30 for Dick Brown's article on this company.

The second and concluding part of the Yates, Nielsson and Hicks paper on the TVA Continuous Ammoniator starts on page 34.

In the past, pesticide storage has been a somewhat neglected subject in farm chemicals literature. On page 42, L. L. Coulter and J. A. Kelly help correct the situation with an article on herbicide storage that will be of value to you and especially your customers.

Safety facts and figures are the subject for W. C. Creel on page 48. The North Carolina official has some interesting comments on the failings of fertilizer plant safety programs.

Last month the Plant Food Producers of Eastern Canada held their annual meeting and we are pleased to include, on pages 52–53, pictures taken at the convention and a brief story on the event.

It has been a month filled with production and consumption figures, so included in this issue are three shorts concerning: 1952 sulfur consumption (page 46), 1953 superphosphate production (page 50) and 1953 potash production (page 55).

Other brief features include information on the fast developing use of antibiotics as plant fungicides, activities of the Fertilizer Safety Section, data from three papers presented at the recent CSMA meeting, and—the first report on a new General Chemical weedkiller said to control Johnson grass.

Sell *Pittsburgh* 2,4-D WEED KILLERS

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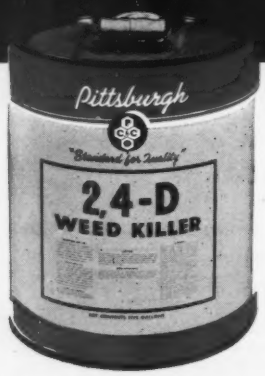

Good 2,4-D sales! They can often brighten your entire farm chemical profit picture! That's why it will pay you to carry a good stock of *Pittsburgh* 2,4-D Weed Killers right through 1954. When you handle *Pittsburgh* 2,4-D, you have a solid, hard-working sales program backing you up every step of the way: (1) Quality-controlled chemicals and fast dependable deliveries because we're a *basic* producer. (2) Assured weed-killing performance in your customers' crops because *Pittsburgh* 2,4-D is *field-tested right in your area.* (3) A complete advertising program to promote your sales—including farm paper ads, literature, window streamers and newspaper mats. The result? Sell *Pittsburgh* 2,4-D and you're sure to "Sell More in '54!" Send for complete details now!

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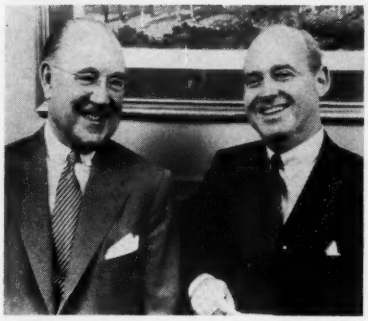
INDUSTRY News

Approve Olin Mathieson Merger



John M. Olin and Thomas S. Nichols, board chairman and president respectively of Olin Mathieson Chemical Corp.

Special meetings of stockholders in Mathieson Chemical Corp. and Olin Industries, Inc. were held on June 29 to approve merger of the two companies into a new corporation, Olin Mathieson Chemical Corp. The new organization has assets of about $500,000,000 and sales of over that figure.

John M. Olin, former president of Olin Industries, is chairman of the board of the new concern; Thomas S. Nichols, president and chairman of Mathieson, is president and John W. Hanes, Olin financial vice president, is chairman of the Finance committee.

Both meetings passed a restricted stock option plan for executives of the new corporation to be substituted for similar plans previously in effect in the two original companies.

Present plans do not include any changes in basic operation, according to Olin and Nichols, and principal offices will continue in East Alton, Ill.; Baltimore, Md.; New Haven, Conn. and New York City. The merger forms a company with about 36,000 employees, 43 plants in 24 states and 16 plants in foreign countries.

Canadian Industries Split

Division of Canadian Industries, Ltd. into two separate companies, Canadian Industries (1954) Ltd. and the DuPont Co. of Canada Ltd. has resulted from a U. S. court judgement ordering Imperial Chemical Industries Ltd. and E. I. duPont de Nemours & Co., to segregate their joint interests in the Canadian company.

The new CIL organization will operate among other facilities the Farm Chemicals Department of the former company and will have about 6,000 employees.

H. Greville Smith remains as CIL president with other officers including Leonard Hynes and W. T. D. Ross, vice presidents; D. W. Shales, secretary and E. L. Hamilton, treasurer.

Construction Set for New Missouri Nitrogen Plant

Immediate construction is scheduled for the 15 million dollar ammonia plant to be erected by Mississippi River Fuel Corp. near Crystal City, Mo. Prime contract has been awarded to The Fluor Corp., Ltd.

Wm. G. Marbury, president of the firm, stated that the company expects to be supplying anhydrous ammonia, ammonium nitrate and ammonia solutions to the fertilizer industry and some industrial accounts by early 1956. Initial capacity will be about 140,000 tons per year of these products.

Announcement of the construction followed acquisition by Mississippi River Fuel of the Natural Gas & Oil Corp., a gas and oil exploratory company.

Hercules Producing NH_3

Production of anhydrous ammonia at the Missouri Ammonia Works at Louisiana, Mo., has begun, Hercules Powder Co. reports. One line is operating and the remaining two are scheduled to enter production shortly.

Facilities of the former ordnance plant are being studied for the possibilities of producing other chemicals, among them methanol, formaldehyde and pentaerythritol.

NFA Points to Top Plant Food Value

Since 1953 the average cost of plant food in chemical fertilizer has risen only 12 per cent, according to the National Fertilizer Association. During the same period, NFA reports, the cost of all goods and services used in farm production has increased by 132 per cent.

Official USDA records show that the cost of fertilizer increased by 51 per cent; however, the average plant food content also increased nearly 35 per cent, largely offsetting higher costs. The figures show that fertilizer prices have increased far less than those of other commodities or services used on the farm even when the increase in plant food content is ignored.

Epps Elected Fert Control Group Head

E. A. Epps was elected president of the Association of Southern Feed & Fertilizer Control Officials during the group's annual meeting on June 21-22 at Oklahoma City, Okla. Other new officers include M. P. Etheredge, vice president; Bruce Poundstone, secretary-treasurer; N. L. Franklin, H. H. Hoffman, R. W. Ludwick and retiring president, Parks A. Yeats, directors.

In his address, Yeats suggested that the association, with cooperation from industry and government agencies, study means by which information on feed and fertilizer distribution could be better collected and released. He also cited the need for a uniform procedure in evaluating and publishing deficiencies.

Speakers included Dr. Randall Jones, associate dean, and R. O. Woodward, extension agronomist, Oklahoma A&M. A panel on "How Can A Fertilizer Control Official Assist in Improving the Agricultural Program," included Maurice B. Rowe, Virginia; C. C. Crawford, Crawford Chem. Co.; Byrle Killian, Okla. vo-ag teacher and Harry James, Okla. county farm agent.

The group visited the Oklahoma Department of Agriculture's new feed and fertilizer laboratory during the sessions. Both control officials and industry representatives attended the meetings.

Discontinue Coke Oven Ammonia Research Group

Effective June 30 the Coke Oven Ammonia Research Bureau, Inc. was discontinued. Headed for 15 years by H. H. Tucker, president, it represented 25 by-product ammonia producers.

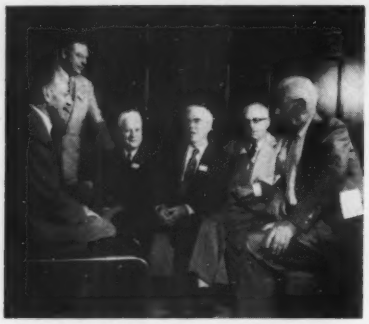
It was decided to disband the unit when one of the larger participating firms announced its intention of withdrawing from the bureau to begin its own promotion program.

Neither Tucker nor Dr. Aaron Baxter, another staff member well known in the industry, has announced his plans for the future, although it is known both would like to remain in the industry.

Good Nematode Control

South Jersey carrot growers are said to be enthusiastic over results of EDB fumigation for nematode control. Rutgers extension specialist Leland G. Merrill, Jr. says that soil fumigated in the fall of 1952 still has not shown a return of heavy nematode populations.

Spencer's Top Farm Bankers



"Distinguished Farm Bankers," left to right, are John H. Crocker, D. E. Crouley, Roy A. Sweet, R. N. Downie, James R. Kenner and E. J. Evens.

THE COUNTRY banker's vital role in the agricultural life of his community, in this day of high-priced farming, is receiving more recognition than ever before

One of the stronger "promotions" today to focus attention on the job the farm banker can do in encouraging profitable farming is being conducted by Spencer Chemical Co. Over the past fertilizer year, the company went out in search of an outstanding farm banker in each of six Midwest states.

These six bankers, who were to exemplify the better farm banking practices of today, were chosen—logically enough—by their colleagues in the banking field. Top names went out in ballots to all the managing bank officers, and six Distinguished Farm Bankers, representing Illinois, Missouri, Iowa, Minnesota, Kansas and Nebraska, were selected. Attention was focused both on the bankers and their farm practices at this time in the daily, weekly, farm and bank press.

More recently the six Distinguished Farm Bankers got together in Kansas City to meet the press, and to set up a "Platform for Better Farm Banking."

In preparing a guide for farm bankers, the group first settled on farm education.

Under the heading, "Farm Know-How," the group declared, "We believe that bankers in farming communities should keep abreast of the rapidly changing developments in farm technology. This involves close personal contacts with the local county agent, teachers of vocational agriculture and Soil Conservation Service men, as well as the close reading of farm publications and occasional visits to the state college."

The next general recommendation made for farm bank use was the hiring of a "farm service manager." A skilled agricultural representative, they stated, not only aids the bank in its farm credit work but also can be of immeasurable assistance to the bank's customers in showing the way to a sound, scientific farming program.

Farm meetings were next recommended as a further educational aid. Farm youth programs, to encourage young people in farming, were also a plank in the platform, and the last two points dealt with production and long-term loans.

Concerning production loans, the group stated: "Recognizing the fact that bankers can have great influence on the philosophies and methods of farm customers at the time they apply for loans, we propose that bankers make every possible effort to interest borrowers in better farming techniques and to make sure the loan granted will finance such operations."

The Distinguished Farm Bankers who formulated the program are: John H. Crocker, president of the Citizens' National Bank, Decatur, Ill.; E. J. Evens, cashier of the Citizens' Bank, Amsterdam, Mo.; Roy Sweet, president of the Story County State Bank, Story City, Ia.; D. E. Crouley, vice president of the Northwestern National Bank, Minneapolis; R. N. Downie, president of the Fidelity State Bank, Garden City, Kans. and James R. Kenner, president of the Thayer County Bank, Hebron, Nebr.

The recent meeting of the "distinguished six" winds up the program for the 1953-54 fertilizer year, but Spencer is not through. Next fall the program starts anew in six other farm states.

Ten Ammonia Certificates

Recent certificates of necessity issued by the Office of Defense Mobilization included 10 for ammonia facilities, all with 45 per cent allowed for accelerated tax amortization. The largest was a $18,-725,000 certificate issued to Utah Chemical Co., Mt. Pleasant, Utah.

Other certificates and the companies, locations and amount certified included: Solvay Process Div., Allied Chem. & Dye Corp., Hopewell, Va., $7,800,000; Shell Chemical Corp., Pittsburgh, Calif., $371,-900; Texas Div., Dow Chemical Co., Freeport, Tex., $3,600,000; Columbia-Southern Chem. Corp., Natrium, W. Va., $3,030,000; Atlas Powder Co., Atlas, Mo., $6,750,000; Ammonia Chem. Corp. of Calif., Oleander, Calif., $4,000,000; Alabama By-Products Corp., Tarrant, Ala., $5,800,000; National Distillers Products Corp., Tuscola, Ill, $7,000,000 and Columbia River Chemicals, Inc., by Wm. R. Gruber, Pasco, Wash., $10,251,000.

Maneb Is New Coined Name

Maneb has been selected by the Interdepartmental Committee on Pest Control as the coined name for the fungicide manganese ethylene bis-dithiocarbamate. It has previously been known by the chemical name and also as manganese EBD, MnEBDm and sometimes MEB.

The name Maneb refers to the pure chemical and a technical grade must indicate the percentage of active material present. It is commercially available as "Manzate" from DuPont in a 70 per cent wettable powder formulation.

Ocean Phosphate Deposits

According to recent reports, Dr. Robert S. Dietz, oceanographer with the Naval Electronics Laboratory, San Diego, has described nodular underwater deposits of phosphates on the edge of California's continental shelf.

NAC Meeting Set For Spring Lake, Sept. 8-10

The 21st annual meeting of the National Agricultural Chemicals Association will be held Sept. 8, 9, 10, 1954, at Spring Lake, N. J., according to an announcement by Lea S. Hitchner, executive secretary. He reported that headquarters for the meeting will be The Essex and Sussex with accommodations for representatives at the nearby Monmouth.

"We expect between 500 and 600 representatives of the pesticide industry at our meeting this fall, judging from the advance registration and interest expressed in many quarters," Hitchner said.

Business sessions will be held each morning of the three day session. The committee responsible for setting up the program is headed by Richard Yates, sales manager, Agricultural Chemicals, Hercules Powder Co. Other members include Howard J. Grady, vice president, California Spray-Chemical Corp.; P. J. McManus, G. L. F. Soil Building Service and C. Bruce Rennie, general manager, Black Leaf Products Div., Virginia-Carolina Chem. Corp.

Miss Dixie-Pixie

Miss Dixie-Pixie came to life at the annual dealers banquet held by Dixie Guano Co., Laurinburg, N. C. The daughter of the company superintendent was dressed in a costume exactly like the pixie featured in the brand design for Dixie Guano's lawn and garden fertilizer.

Change Pink Bollworm Area

With the addition of 15 northernmost Texas counties to the pink bollworm lightly infested area, all of this state has been placed under regulation for this pest. The upper Panhandle area involved had been almost surrrounded by the regulated area since earlier this year when the last of Oklahoma territory was placed under regulation.

Six Louisiana parishes have been removed from the list since no pink bollworms have been found in the area since the 1950 crop.

Mathieson Farm Grant

A 160 acre tract of land has been made available to the University of Houston by Mathieson Agricultural Chemicals Div. for use as a demonstration farm. It is to become a "clinic" for training ag students, with any profits from the project slated to finance working scholarships.

The tract is located in Pasadena, Tex., near the University and adjacent to a Mathieson plant. It will be operated by the school's Agriculture Department at the nominal rent of one dollar per year.

The farm is expected to demonstrate methods for profitable farming in ordinary Texas coastal soil.

Iowa Spring Pest Survey

A survey of spring field insects in Iowa, conducted by the state extension service, shows that 88,445 acres were treated with pesticides broadcast before planting; 101,300 acres with materials mixed with starter fertilizer and 2,425 treated in other ways.

A total of 61,450 bushels of seed corn were treated with lindane and the major objection to this practice seemed to be a failure to control the wireworm. Cutworms attacked 45,125 acres of corn, 23,340 acres were treated and 7,765 were replanted.

Other figures released: 6,630 acres treated for sweet clover weevil; 9,920 sprayed for clover leaf weevil; 2,005 for pea aphid and 1,700 for both of the latter pests.

Figures were based on returns from 34 counties.

Cite Increased Demand For Phosphate Solutions

Shea Chemical Corp. reports that inclusion of fertilizer grade phosphoric acids within the definition of "fertilizer" for rail tariff purposes, is creating increased demand for the material.

Under the new schedule, fertilizer grade acids move as "phosphoric fertilizer solution (containing not more than 58 per cent of phosphoric anhydride by weight)." This also applied to ammoniated phosphatic solutions. Nitrogen solutions, superphosphate and potassium salts move on the same freight basis.

The rate basis became effective on June 7 in the Southern classification territory and on July 15 in the Eastern area. Actions are pending which will extend comparable rates to other territories.

Toxaphene for Kan. Worms

Hobaugh & Marvin of Wichita and Manhattan, Kan., report that chemical control of the true armyworm in eastern Kansas was accomplished almost entirely through aerial application of toxaphene.

They estimate that about 35,000 acres were sprayed at an average cost of $2.50 per acre. Value of the grain saved will probably average between $15 and $25 per acre.

Reilly Speaks on Nitrogen Industry, Supply Forecast

Speaking before the New York Society of Security Analysts, J. R. Reilly, Jr., vice president of Spencer Chemical Co., stated that the nitrogen industry is in a "healthy position" and that supply and demand should be "fairly well in balance" over the next two years.

He added that for the first time in 10 years there are indications that there will be enough nitrogen to meet all needs, and perhaps a small surplus, instead of past supply shortages. This situation, Reilly said, will for the first time permit active sales promotion activities and programs.

His nitrogen supply forecast showed for 1953 a total indicated supply of 2,750,000 tons composed of 2,100,000 tons synthetic; 180,000 tons byproduct; 40,000 tons organic and 430,000 tons imports. For 1954-55 he predicted synthetic production of 2,500,000 tons and other supply sources about the same as 1953-54 for a total of 3,150,000 tons and in 1955-56 forecast a total of 3,500,000 tons with 2,850,000 tons synthetic, no change in by-product and organic sources and imports at 430,000 tons.

His estimated consumption figures included for agriculture in 1953-54—1,900,000 tons; 1954-55—2,100,000 tons and 1955-56—2,300,000 tons. Looking well into the future, Reilly saw a total demand of 5,525,000 tons of which farm usage comprised 3,900,000 tons.

CFA Plans Second Handbook Edition

The first edition of the WESTERN FERTILIZER HANDBOOK, published by the California Fertilizer Association, has been completely sold out and a second edition is scheduled for release in the near future.

Developed over a period of three and-a-half-years by a subcommittee of the association, the 160 page book has already received wide acclaim. Easily understood by the layman, the Handbook includes information on soil fertility, plant nutrition, irrigation water and the use of chemical fertilizers in relation to Western agriculture.

To obtain copies of the second edition send $1.00 for each Handbook desired (includes tax and mailing) to the California Fertilizer Association, 475 Huntington Drive, San Marino 9, Calif. Please order directly from CFA and not through FARM CHEMICALS.

TVA Pesticide Contracts

Recent contracts announced by TVA included Riverdale Chemical Co., weed killing chemicals, $102,780, and E. I. duPont de Nemours & Co., brush control material $198,966.

Another Davison Safety Record

Davison Chemical Co. Div. has been presented the Award of Honor of the National Safety Council for 1953, repeating successes secured in 1950 and 1951. In accident frequency, Davison was 59.7 per cent below the industry average and in accident severity was 68.9 per cent below the average. Shown above at the presentation of the award are (l to r): W. B. McCloskey, vice president, chemical operations; A. B. Pettit, director, industrial health and safety; J. P. Rostmeyer, executive secretary, Baltimore Safety Council; J. W. Carothers, council president and Marlin Geiger, Davison president.

Fluor Awarded Contract For West Coast N Plant

Columbia River Chemicals, Inc. has awarded a contract for design and construction of a 12 million dollar chemical and fertilizer plant in the Pacific Northwest to The Fluor Corp., Ltd. The plant will be located on a site 13 miles from Pasco, Wash., on the Columbia river, 28 miles from Walla Walla.

First major project of its kind in the Northwest, it will produce 160 tons per day anhydrous ammonia, 110 tons urea and 140 tons ammonium sulfate. With the exception of 50 tons of anhydrous ammonia and 15 tons urea, the production will be used for agricultural purposes.

Marketing of anhydrous and aqua ammonia, urea, ammonium sulfate and urea-ammonia nitrogen solutions for agricultural purposes other than export will be handled by Pacific Supply Coop.

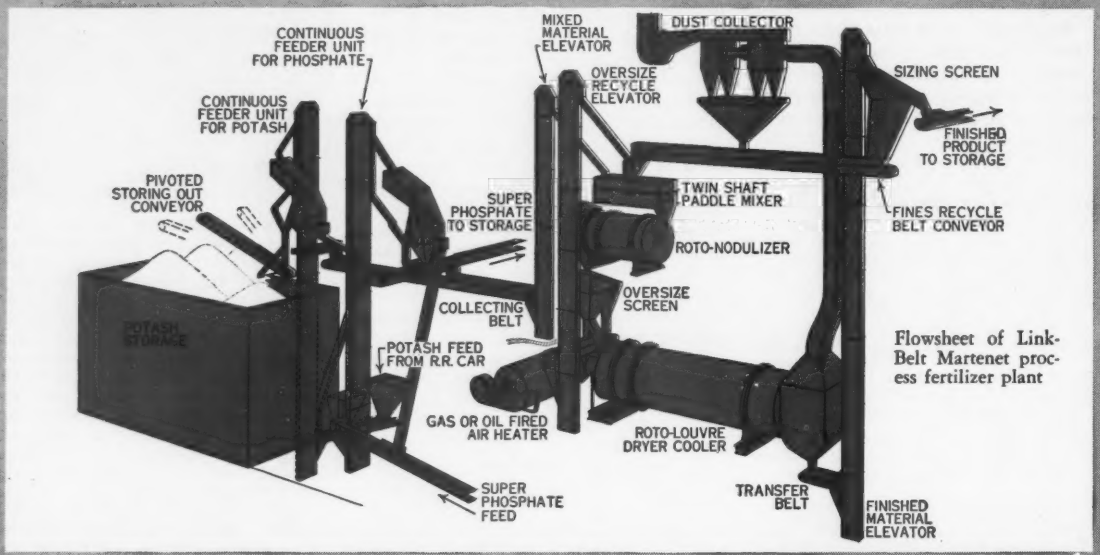
The synthetic ammonia plant will be designed to generate hydrogen from bunker C fuel oil shipped by barge lines on the Columbia river. The unit will also be designed to use natural gas as raw material when available in the area. Urea facilities will be the first in the West.

Fluor has been at work on process design for over two months and field work is scheduled for this fall. Construction is expected to be completed and the plant in production during late 1955.

About 500 men will be employed during construction and 200 will be needed for operation and maintenance when the units are in full production.

THE LINK-BELT MARTENET PROCESS

. . . for better fertilizer at lower cost!



Flowsheet of Link-Belt Martenet process fertilizer plant

Here are the outstanding advantages of this process

1. USES PRESENT FACILITIES. Many of the present facilities in your plant can be converted.

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3. RAW MATERIALS. The Martenet process uses as its sole source of nitrogen such high grade materials as anhydrous ammonia and ammonium nitrate solution.

4. LOW OPERATING COSTS. This automatically controlled process reduces plant manpower to a minimum, keeps power and fuel costs reasonable.

5. VERSATILE. The process will produce all ratios in a very high degree of plant food concentration.

6. GRANULAR—HOMOGENEOUS PRODUCT. The finished product is granular, homogeneous and free-flowing—can be stored for indefinite periods in bulk or bags without fear of cementing particles.

The ability to supply a complete "Martenet Process" installation is another example of the unique "turnkey" service Link-Belt offers you. Link-Belt experience includes dry-mix, superphosphate, nitrophosphate, ammonium nitrate, ammonium sulphate, urea, granulation and other plants.

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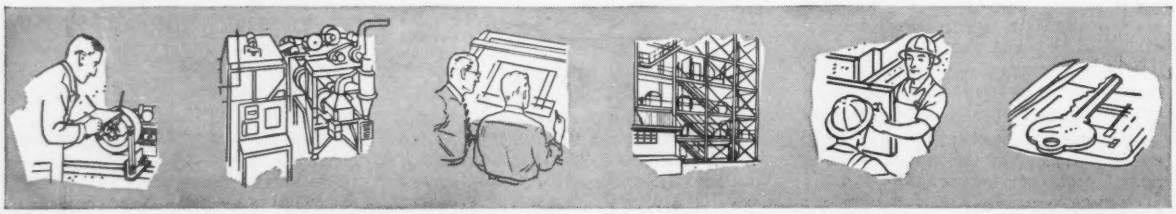

Hester Opens Private Lab.

Jackson B. Hester, soil technologist at Campbell Soup Co. for 16 years, has established a private laboratory on the Elkton-Newark road about one-half mile from Elkton, Md.

A consulting service, soil and plant analysis and research on special problems will be carried out at the laboratory.

Awards to USDA Workers

Ninety-three USDA employees were presented Distinguished Service or Superior Service Awards by Secretary of Agriculture Ezra Taft Benson at a program on May 18.

Among the nine receiving Distinguished Service Awards were Dr. Richard T. Cotton, Agricultural Research Service, Manhattan, Kansas, "for outstanding world leadership in the field of control of insects attacking stored grains and cereal products," and Oris V. Wells, Agricultural Marketing Service, Washington, D. C., "for outstanding vision and initiative in developing and evaluating economic and statistical analyses and interpretations for use in the development and administration of sound agricultural programs for the nation."

Richard T. Bingham, Forest Service, Berkeley, Cal., and Dr. Samson R. Dutky, Agricultural Research Service, Beltsville, Md., were two of the 84 USDA employees who received Superior Service Awards, Bingham for his work with white pines and improving disease survey methods, and Dutky for his work with Japanese beetle larvae.

Superior Service Awards were to be presented at unit headquarters to 13 units including the Delta Work Unit, Soil Conservation Service, Delta, Utah, "for development of a widely accepted, well-rounded conservation program for a semi-arid area, involving particularly successful methods of water control and use in saline soils;" Garden City, Kan., Work Unit, SCS, "for perfecting a practical and economical method of revegetating sandy land subject to severe wind erosion while at the same time carrying out a complex technical program on irrigated land" and the Liquefied-Gas Aerosol Project, ARS, Beltsville, "for cooperative research resulting in the development of highly efficient liquefied gas aerosol formulations and equipment for the control of insects harmful to agriculture and public health."

Wisconsin Demonstrations

Wisconsin fertilizer demonstrations for 1954 on grain and legumes, corn and pasture have been announced by C. J. Chapman, extension specialist, soils, College of Agriculture.

Industry-donated fertilizer for the demonstration includes 46 tons from funds of Middle West Soil Improvement Committee, American Potash Institute and Coke Oven Ammonia Research Bureau; ammonium nitrate from Spencer Chemical Co.; 12-12-12 or 13-13-13 by Allied Chemical & Dye Corp., Davison Chemical Co., Mathieson Chemical Co. and urea from Allied Chemical & Dye and Grace Chemical Co.

Mineral Lease Regulations

Douglas McKay, Secretary of the Interior, has approved laws governing issuance and regulation of sulfur, oil, gas and other mineral leases for operations in the submerged lands of the outer continental shelf.

Some major points covered in the leasing regulations include:

Provision for competitive leasing of all outer continental shelf lands and rental terms to be stated in the notice of lease offer which will be published in the *Federal Register*.

Bidding may be done by any citizen of the United States, association of such citizens or domestic corporation. Sulfur leases will be issued for a period of 10 years and so long thereafter as sulfur is produced or plant construction or other operations for production of sulfur are conducted on the lease.

New Safety Booklet For Small Businesses

A new booklet, "Plus Cost," produced by the National Safety Council for small firms with relatively few employees and no safety staff, sets down seven easy steps for eliminating accidents.

It relates the how and why of accident control and tells how accidents cut away profits. Single copies of the attractively illustrated eight-page booklet can be obtained by writing Small Business Program, National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

NSC Members Set Record

Workers employed by member companies of the National Safety Council had the safest year on record in 1953 with a substantial reduction in both frequency and severity of accidents as compared with 1952.

The industry average showed a frequency rate of 7.44 disabling injuries per million man-hours, down 11 per cent from 1952 and a severity rate of .83 time charges per thousand man-hours, down 6 per cent. The chemical industry had a frequency rate of 4.53, down 11 per cent, and a severity rate of .81, up 47 per cent.

N. C. 'Nickels' Referendum

A referendum will be held this year to determine whether North Carolina farmers wish to continue the "Nickels For Know-How" fund, for which they assess themselves five cents a ton on feed and fertilizer for the promotion of agricultural research.

Associations & Meetings

Safety Guide Available

Release of "Guide for Safety in the Chemical Industry," a new safety manual sponsored by the Manufacturing Chemists' Association, has been announced. The 228 page book is profusely illustrated and covers a wide range of lab safety subjects.

Price of the book is $4.25 per copy with discounts on quantity purchases. Further details are available from the publishers, D. Van Nostrand Co., Inc., 250 Fourth Ave., New York 3, N. Y.

GPFES Prizes Awarded

Prizes totaling $1,950 have been awarded by the Georgia Plant Food Educational Society to winners of the Georgia Grazing System Contest. Designed to honor state farmers with outstanding grazing systems, the contest was termed an outstanding success and the society has announced that it will again provide prizes for continuation of the affair.

Rules for the Horticultural Essay Contest sponsored by GPFES were announced at a recent board meeting. Conducted for FFA members, the contest includes $500 in prizes provided by the society.

Another activity of the GPFES includes allocation of $250 to the Georgia College of Agriculture for purchase of paper containers for soil samples to be analyzed by state soil testing laboratories. They will be distributed free through the laboratories and the Extension Service.

As added encouragement for soil testing, the Extension Service also plans to offer for sale to fertilizer manufacturers (at about 1½ cents each) similar bags.

Oscar Johnson Bldg. Slated

Members and trustees of the Oscar Johnston Cotton Foundation have authorized immediate construction of an Oscar Johnston memorial building at Memphis, Tenn., to serve as permanent headquarters for the National Cotton Council.

An agreement between the trustees and the NCC board of directors provides for construction of the building at a cost of about $400,000 with subsequent lease to the council. Occupancy is scheduled sometime prior to July 1, 1955.

Two of NCC's four program divisions, Sales Promotion and Production and Marketing, together with the office of the executive vice-president, Field Service Dept., Market Research, Public Relations and Accounting Sections will be housed in the new Memphis building.

S. C. Fertilizer Meeting

Nov. 3 and 4 have been set as dates for the South Carolina Annual Fertilizer meeting for fertilizer dealers, salesmen and manufacturers. Hotel reservations should be made directly with the Clemson House, Clemson, S. C. A complete program will be released at a later date.

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Learn how you can switch from bag to bulk phosphate storage with Butler bolted steel phosphate tanks and add new profits to your operations! The Butler representative in your area is listed on the opposite page . . . call him today. He'll also show you how Butler tanks are specifically designed for the storage of phosphate, super phosphate, triple phosphate, potash, lime and similar fertilizers. You can load spreader trucks faster and easier to cut handling costs and time . . . increase your daily volume of tank-to-field deliveries.

What's more you can take advantage of lower prices on bulk rock phosphate . . . stock up ahead for rush seasons. Heavy-gauge steel sections, bolted and sealed tightly, keep Butler tanks phosphate and weather-tight . . . give them strength for heavy loads, strong winds.

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This Butler phosphate tank helps the J. B. Walton Farm Supply, Mendota, Ill. cut handling costs and give customers fast service.

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People

During graduation exercises at the North Carolina State College, the honorary degree of Doctor of Agriculture was conferred upon John W. Turrentine, president emeritus, **American Potash Institute.**

Turrentine

In his citation, Dean D. W. Colvard referred to the pioneering work by Turrentine in research on the chemistry of potash.

Another Institute staff member, Dr. Niven D. Morgan, the Southwest representative, has been honored with the award of Master Agronomist by the Oklahoma A&M College. This is presented by the college Agronomy Department in recognition of outstanding achievement in the field of agronomy.

Effective August 31, Howard L. Bayne will retire as manager of the Kansas City plant and sales division of **Bemis Bro. Bag Co.** He will be succeeded by L. E. Cox, the present assistant manager.

The Bemis company has also announced appointment of R. W. Lahey, Jr. as sales manager of the Norfolk plant.

Karl F. Einsiedel, Chicago, now represents **Bostwick Labs** and U. S. Packaging Div. in sales of aerosols.

Dr. R. H. Wellman has been named assistant manager of the Fine Chemicals Dept., **Carbide & Carbon Chem. Co.** He will be responsible for sales and market development of the Crag line of farm chemicals. Wellman was formerly in charge of biological research for the company.

New directors of **Chemical Enterprises, Inc.** include Julian A. Space, Jr., and J. C. Berry. Berry is president of Louisiana Liquid Fert. Co. and is currently serving as head of several CE affiliates including those in Louisiana, Texas and the Pacific Northwest. He is also well known in northern Louisiana as a cattle-raiser and cotton grower.

Space is executive vice president and director of Johnson, Lane, Space & Co., Inc., Savannah investment bankers, and is president and director of the Herald Publishing Co., Augusta, Ga., in addition to other interests.

Columbia-Southern Chem. Corp. has appointed Alvin G. Gottschall as sales representative for the New Orleans district office. Prior to joining Columbia-Southern he was associated with Gulf Refining Co.

James A. Farley has been named field sales manager, Industrial Chemical Sales Dept., **Commercial Solvents Corp.,** with headquarters at New York. He will be responsible for administration of domestic district offices.

Farley

Other CSC moves include appointment of G. H. Snider as manager of the Boston district office replacing Farley; J. H. Brinton Marple as manager of the Louisville, Ky., district office, a position formerly held by Snider. Arthur F. Williams will be attached to the New York office in place of Marple.

New northeast area director for the **Commodity Stabilization Service** is Harris W. Soule, Burlington, Vt. He will be responsible for administration of production adjustment and price support programs in 13 Northeastern states.

Dr. S. L. Wilson was among recent appointees to the research staff of the **Connecticut Agricultural Experiment Station.** A member of the Plant Pathology Dept., Dr. Wilson will devote much of his attention to investigating the effect of pesticides on food plant quality.

William E. McGuirk, Jr. has been named executive vice president of **Davison Chem. Co. Div.** The former vice president of W. R. Grace & Co. will make his headquarters in Baltimore.

A number of recent appointments have been released by **Diamond Alkali Co.** Included are: Wm. H. Evans, vice president; John W. Mantz, general manager, Silicate, Detergent, Calcium Div.; L. T. Welshans, general manager, Cement & Coke Div.; C. R. Brown, asst. works manager, Painesville plant; Robert Mcs Connell, manager of industrial relations at Painesville; Arthur P. Schulze, manager of public relations and advertising and Oscar E. Kuhlman, assistant to Schulze.

Fulton Bag & Cotton Mills has advanced Lewis H. Merrill to the position of assistant manager of the New York office. Fulton has also named James A. Mundie as sales supervisor at the New Orleans plant.

Harrold B. Jones has been named sales representative for **Geigy Agricultural Chemicals** in Mississippi. Jones will be located at Leland, site of a Geigy sales office and plant. He was formerly supervisor of the Blanco Gin Co., and prior to that held positions with the Tennessee Extension Service and OPS.

Chester F. Hockley and Marlin G. Geiger have been elected to the **W. R. Grace & Co.** board of directors. Hockley is chairman of the Davison Division advisory board and Geiger is vice chairman of the advisory board and president of Davison.

Died: John M. Hattrick, founder of **Dominion Potash, Ltd.,** managing director of United Potash Co. and Potash Limited, on May 11 in London.

New assistant vice president, Industrial Products Dept., **J. M. Huber Corp.,** is Gerald W. Harris. The company also announced appointment of Paul W. Libby as manager of the Borger, Tex., development laboratories and of Louis F. Gongwer as divisional manager of sales to the rubber and general industries.

On July 1, George T. Harley retired as manager of the **International Minerals & Chem. Corp.** potash mines at Carlsbad, N. M. He has been an engineer, geologist and college professor and headed the International Carlsbad potash mining operations for 10 years. Carl Arend succeeded Harley as active manager in January and since that time Harley has served as special consultant and advisor for the operation.

Two executive additions to the staff of **Chas. H. Lilly Co.** include appointment of Jack McConkey as general sales manager and Art Burkette as manager of the Ellensburg, Wash., branch.

McConkey, former Seattle manager of Balfour, Guthrie & Co.'s Fertilizer Dept.,

Burkette

McConkey

will direct wholesale dealer sales activities of the company and its seven branches.

Burkette headed the Fertilizer and Insecticide Div. of Galbraith & Co. for seven years prior to joining the Lilly organization. He will be in charge of sales in the Kittitas valley, Yakima and Columbia Basin areas of eastern Washington.

Died: Vice president and manager of the **Miller Chemical & Fert. Corp.** Whiteford, Md., plant, A. Thomas Bradley on May 12.

Formerly general superintendent of production for **Monsanto Chemical's** Wm. G. Krummrich plant, Clarence Babre has been named technical advisor in the farm chemical field for the Inorganic Chemical Div. Development Dept. He is to assist in development of plans and programs for expansion of division activity in the farm chemical field.

The National Fertilizer Association has announced expansion of its staff with the addition of Peter C. Crolius as editorial assistant. Crolius will assist Del Rucker in conducting information and public relations programs of the association.

Crolius

He was graduated this year from Cornell University's Department of Extension Teaching and Information in the College of Agriculture and is a veteran of both Army and Navy service.

Dr. R. B. Bahme has been named manager, Agricultural Chemicals Dept. of **Pacific Guano Co.** He was formerly with the Grasselli Chemicals Dept. of DuPont.

Bingham

Plant Food Corp. has appointed John J. Bingham as manager of the northern division with headquarters at Bakersfield, Calif. He was formerly with Pacific Guano Co.

Logan G. Hill and A. A. Roetzer are new assistant general sales managers of the Multiwall Packaging Div., **St. Regis Paper Corp.** Hill will assist vice president C. A. Woodcok in sales management activities, particularly liaison with national accounts and Roetzer will coordinate sales and engineering activities in all phases pertaining to packaging equipment and engineering.

The company has also transferred John Brent from the New York office to the Southwest district of the Multiwall Packaging Div., assigned to Tenn. and Ala.

In a reorganization of the Marketing Dept. of **Shell Chemical Corp.,** Geo. W. Huldrum, Jr., has been appointed general sales manager. He will supervise management of sales groups and chemical products managers and will report to L. V. Steck, marketing vice president.

Other Shell changes include naming J. M. Selden as assistant to the vice president and W. E. Keegan as sales manager. Shell's Eastern and Western Divisions, as such, have been dissolved and district offices will report to New York. G. R. Monkhouse will continue as senior corporation representative on the West Coast as vice president in charge of the Ammonia Division.

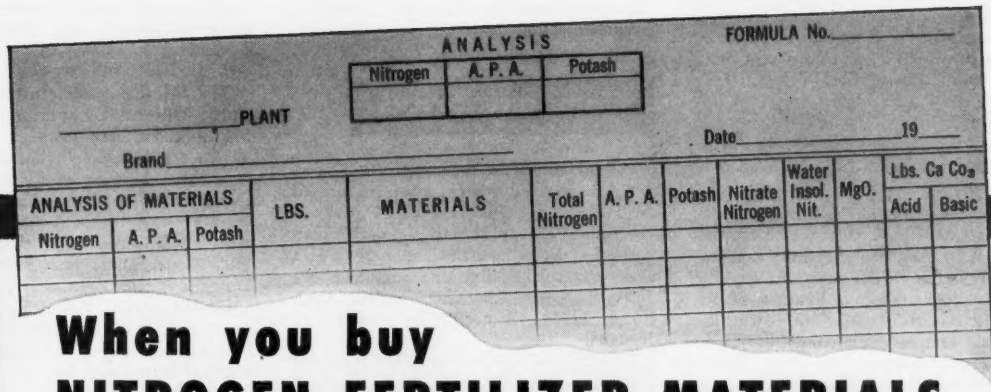
T. H. Paulsen, formerly assistant to the vice president in charge of manufacturing and cost estimation, has been appointed chief process engineer of **Sinclair Chemicals, Inc.** Sinclair has also named Robt. C. Sweeney assistant manager of market development.

Manager of the newly-organized Central Sales Div., **Stauffer Chemical Co.,** is Harold J. Klee, former manager of the Chicago sales district. He will continue to make his headquarters in Chicago. J. H. Beagley has been appointed Chicago manager.

Klee

Wohlwend

Stauffer has added Alfred N. Wohlwend to the technical sales staff with headquarters in New York.



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"Controlled Quality"

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When you visit El Dorado or New Orleans you will want to inspect Lion's giant chemical plants where Lion Nitrogen Fertilizer materials are manufactured. You'll be impressed by the painstaking efforts to assure highest quality products... reaching you in first-class condition. This is what we mean by "Controlled Quality"—which can mean a great deal to you.

"Controlled Quality" is your assurance that you will be formulating with only top grade nitrogen materials... that you will be selling *quality products.*

Enduring business success must be built on high quality. When you buy Lion Nitrogen Fertilizer materials, you can be sure you're building your business on a sound foundation... fortifying yourself for the highly competitive period ahead.

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specialized technical assistance

LION ANHYDROUS AMMONIA—For formulation. A uniformly high-quality basic product. Nitrogen content, 82.25%.

LION AQUA AMMONIA—For formulation or acid oxidation. Ammonia content about 30%. Other grades to suit you.

LION AMMONIUM NITRATE FERTILIZER—For formulation or direct application. Improved spherical pellets. Guaranteed 33.5% nitrogen.

LION NITROGEN FERTILIZER SOLUTIONS—For formulation. Three types to suit varying weather and manufacturing conditions.

LION SULPHATE OF AMMONIA—For formulation or direct application. Large free-flowing crystals. Guaranteed nitrogen content, 21%.

TECHNICAL SERVICE—Lion provides special technical assistance for fertilizer manufacturers. Write to CHEMICAL SALES DIVISION for quick service.

LION OIL COMPANY
EL DORADO ARKANSAS

Roger W. Gunder, former Los Angeles sales district manager has been promoted to western sales manager for Stauffer with offices in San Francisco.

James C. Totman, assistant treasurer and manager of the **Summers Fertilizer Co.** Bangor Me., office was a successful candidate in the recent Maine primary election. He was running on the Republican ticket for reelection to his third term in the state legislature. Jim is also a candidate for Republican floor leader in the House.

Union Carbide & Carbon Corp. has appointed Dr. Augustus B. Kinzel as director of research with responsibility for administration and co-ordination of research activities of all Union Carbide divisions. His research contributions to the organization have covered a variety of activities in the fields of metallurgy, industrial gases and atomic energy.

Robbins

New general manager of construction for **Walter Kidde Constructors, Inc.** is E. G. Robbins, former assistant to the late C. W. Knowles, senior vice president in charge of construction.

James G. Minahan is now resident salesman for the Michigan Alkali Div., **Wyandotte Chemicals Corp.** with headquarters in Philadelphia. He was formerly in charge of sales for the Detroit office of General Chemical Div. for Baker & Adamson products.

Company Briefs

Allied Chemical International Corp., a new export subsidiary, has been formed by Allied Chem. & Dye Corp. It will consolidate all export activities of AC&D's operating divisions with Canada and Latin America. The divisions included are Barret, General Chemical, National Aniline, Nitrogen, Semet-Solvay and Solvay Process.

Edward M. Melton has been named general manager of the subsidiary which will have offices at 40 Rector St., New York City 6.

Entry of **American Cyanamid Co.** into production of industrial chemicals from natural gas was marked by dedication of the new Fortier, La., plant. Construction began in 1952 and production units currently operating include sulfuric acid, oxygen and ammonium sulfate.

A new Commercial Development Dept. under the direction of Edward J. Goett, has been announced by **Atlas Powder Co.** For the past 12 years Goett had been employed by Charles Pfizer Co.

Bersworth Chemical Co. has changed its name to Versenes Incorporated reflecting a position as the world's largest producer of amino acid chelating agents (Versenes).

The Mexican affiliate of **California Spray-Chem. Co.,** Insecticides Ortho, has opened a new farm chemicals plant at Mexicali, Baja, California. The unit has a warehousing point and dust mill for production of finished insecticides.

A new office serving the Southwest and Gulf Coast areas has been opened by **Davison Chem. Co. Div.,** at 4101 San Jacinto, Houston, Tex. John Benedict will handle sales of fluid cracking catalysts and other products to petroleum refiners and C. Victor Bolles will handle industrial chemicals sales.

The Raymond C. Crippen research and development labs are now known as **Crippen and Erlich Laboratories, Inc.**

Plans for construction of a unit for manufacturing of Freon-22 at Louisville, Ky., have been announced by the **DuPont Kinetic Chemicals Div.** The plant will be built under the direction of the company's Engineering dept. and completion is scheduled for early fall, 1955.

With the addition of Illinois, Maine and Wisconsin a total of 43 states now

participate in the National 4-H Club's Entomology Awards Program sponsored by **Hercules Power Co.** Awards include gold-filled medals of honor, wrist watches, 12 trips to the 4-H Congress and six college scholarships of $300 each.

Research and Development Division and labs of the **Merrill Co.**, San Francisco, have been acquired by Arthur D. Little, Inc. The recently established ADL office in that city serves as a base for West Coast technical-economic survey work.

First shipments of sulfur from the San Cristobal, Veracruz, Mexico plant have been made by the **Mexican Gulf Sulphur Co.** Destination of the initial product was a Mexico City chemical company.

Nitrogen Division, Allied Chem. & Dye Corp. is now sole United States distributor for Belgium produced ammonium-nitrate-limestone. The material will be stored at major Eastern and Gulf ports and will be sold through regular division channels by present sales representatives.

Pacific Coast Borax Co. has entered the organic chemical field with sample quantity offerings of organic borate esters. It is expected that they will serve as starting materials for a diversified group of organic compounds.

A Detroit sales office, recently opened by **Pennsylvania Industrial Chem. Corp.,** will handle activities in Ohio, Kentucky, Michigan and part of Indiana.

New **Pennsylvania Salt Mfg. Co.** plants are slated for Delaware, O., and Chicago Heights, Ill. Both will serve as components of the Chemical Specialties Div. with blending, packaging, warehousing and distribution facilities for a wide variety of products. Completion is expected during 1954 with construction by J. C. Breyfogle of Columbus, O.

Shell Chemical Corp. has acquired assets of Lac Chemicals, Inc., Culver City, Calif. alcohol producers. Included in the sale are Lac real estate, inventories, bonded warehouse facilities and alcohol denaturing plant. Shell plans improvement of its West Coast service by providing local facilities for compounding denatured alcohol and proprietary solvents.

Selection of district sales managers for three new **Spencer Chemical Co.** offices signaled Spencer's entry into the polyethylene field and general expansion in industrial chemicals. The new managers include George N. Olson, eastern district (New York); Howard Millington, Kansas City and H. R. Bishop, north central district (Chicago). Bishop is new in the Spencer organization and was formerly with Armour Chemical Div.

Bishop

Millington

Olson

Wilson & Toomer Fert. Co. is reported to be erecting a $50,000 warehouse at Jacksonville, Fla.

Equipment & Supplies

'Deep Feeder' Subsoiler

An implement that breaks up the subsoil and feeds it in a single operation has been developed by the Pittsburgh Forgings Co. The "Deep Feeder" differs from previous subsoil chisels chiefly in the addition of an integral feeding tube and fertilizer hopper that delivers fertilizer down and into the subsoil area.

Testing is currently underway in areas of the South and the Midwest, and when completed, it is expected that the device will be released for sale through farm equipment dealers.

Aluminum Neoprene Coating

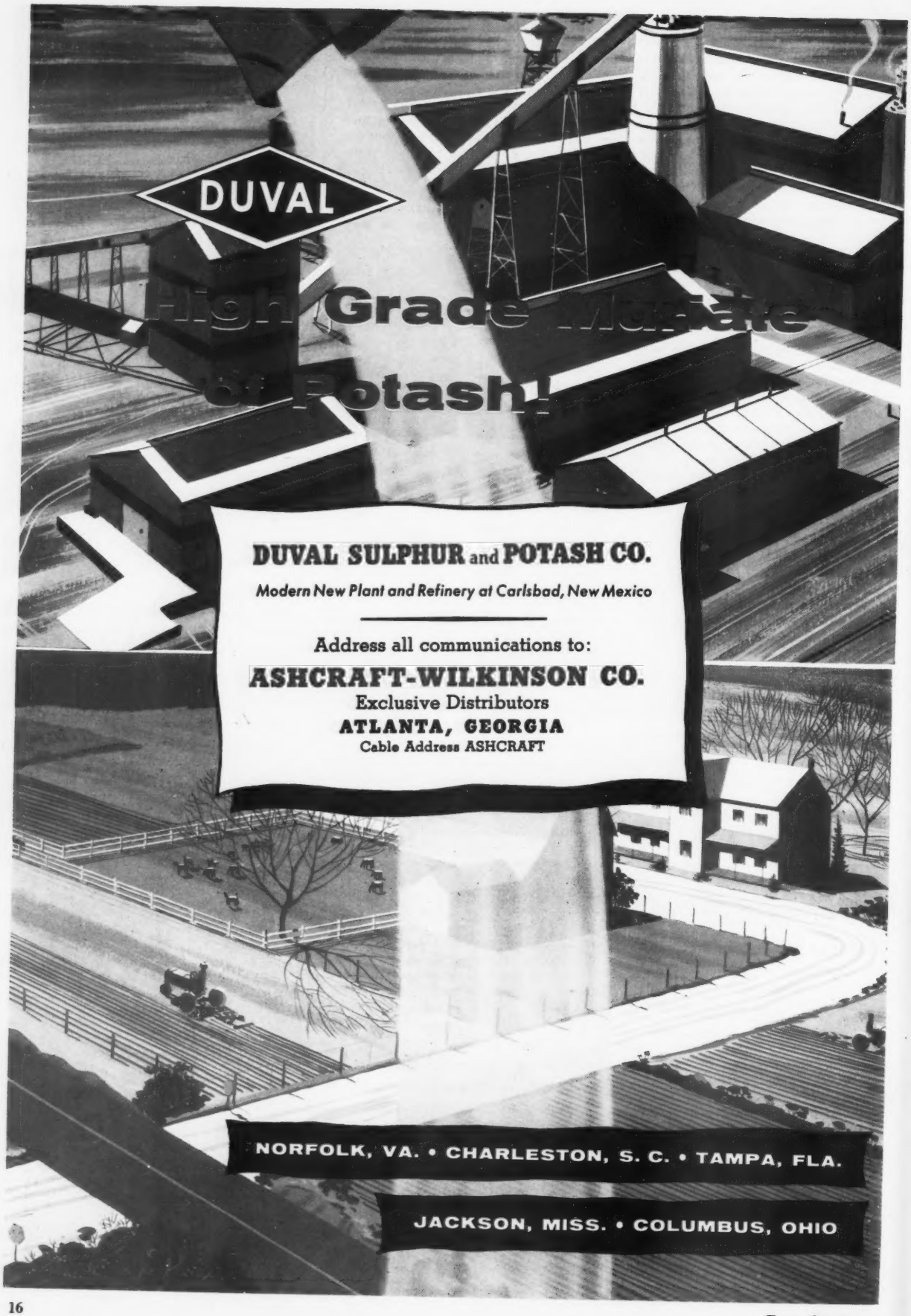
An aluminum neoprene coating for protection of ferrous metals against atmospheric corrosion is being introduced by Chemical Coatings & Eng. Co. Designated SEACO No. 342, it combines chemical and weathering resistance of neoprene with a reflecting, nonfading pigment.

Applied coatings resemble aluminum metal in appearance and, if desired, they can be tinted to give a variety of metallic colors.

Minn. Company Develops New Mixer-Spreader Unit

On July 20, E. S. Gandrud Co., Owatonna, Minn., was scheduled to demonstrate its new three hopper mixer-spreader. All interested persons were invited to attend the premier showing and barbeque.

Speakers scheduled to address the group included A. P. Sale, Jr., manager, Cooperative Fertilizer Service; Dr. Geo. D. Scarseth, director of research, American Farm Research Assn.; Dr. M. E. Weeks, TVA and Dr. Harold Jones, Univ. of Minnesota.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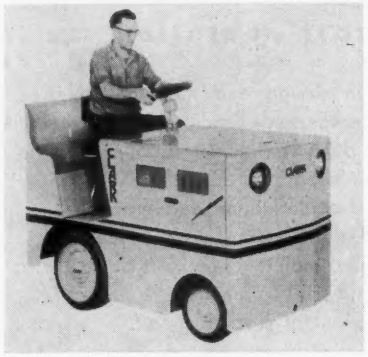
JACKSON, MISS. • COLUMBUS, OHIO

Clark Adds Towing Tractor

Clark Equipment Co. has broadened its line of electric-powered units with the addition of an electric towing tractor. Known as the "Electric Clarkat," it has a normal rayed drawbar pull of 600 pounds and is available with 2,400 or 3,000 pound breakaway drawbar pull.

An optional universal type coupler has the control lever mounted to permit operation within the driver's compartment.



Electric Clarkat

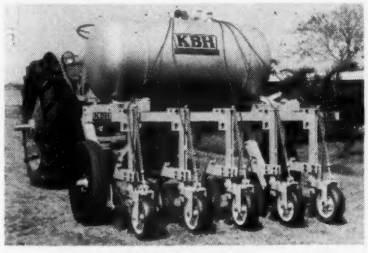
Steering stability is maintained through location of the battery in front of the driver and over the steering axle assembly.

Features claimed include ease of operation, a simple automatic magnetic-controlled electrical system and modern styling. The series motor can develop comparatively large increases in torque or power with moderate increases in current draw.

For more information circle 253 on Service Card.

NH_3 Broadcast Applicator

KBH coulter and press wheel assemblies can convert quickly any model KBH Universal Row Crop Ammonia Applicator to broadcast work. Although designed



KBH Assembly

especially for application to pastures and small grains, they can be used for row crops as well.

A swivel assembly prevents damage if the unit hits an obstruction. The units are equipped with semi-pneumatic rubber tired press wheels with adjustable spring tension. For more information circle 251 on Service Card.

New Y & T Gas Lift Trucks

A completely new line of fork lift trucks, the G-52 series, has been introduced by Yale & Towne Mfg. Co. The two to four thousand pound gas models are smaller with increased power, maneuverability and versatility and feature a fluid coupling built into the drive wheel.

Other features include a specially designed muffler that produces a cooler running engine and hypoid gear drive with four pinion differential. All details are described in an illustrated brochure which can be obtained by circling 255 on Service Card.

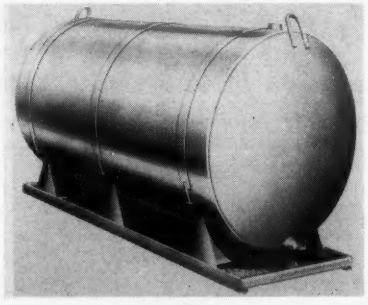
Globe Valve for Sprayers

A new low-cost lever operated globe valve for use on hand spraying equipment is now produced by Ohio Brass Co. The light weight unit is said to be ideal where a boom cannot be used.

Available in five sizes, the valve weighs about two pounds and can be used with water, oil or gas mixtures up to 300 pounds pressure. Write to Ohio Brass Co., Mansfield, Ohio, for data sheet No. 1311 giving further details.

Butler Liquid Nitrogen Tanks

Tanks for storage of low pressure and non pressure bulk liquid nitrogen solutions have been added to the line of Butler Manufacturing Co. New models include



Skid Tank

bolted aluminum bulk tanks for bulk storage plants with capacities of from 12,000 to 23,000 gallons and welded units for storage of low pressure solutions.

Also included are aluminum skid models with 500 to 1,000 gallon capacities which can be carried on a stake body truck for transportation from station to farm. For on-the-farm-application of nitrogen solutions, 100 gallon welded tanks are offered.

For more information on bulk storage units, see item 231 on Readers' Service pages.

Flow Meter Device

A new device, known as the Dall Flow Tube, for metering liquids and gases, has been produced by Builders-Providence, Inc., a division of B-I-F Industries, Inc.

Designed for use with gases and liquids carrying no settable solids, it consists of a short, flanged, cylindrical body with an abrupt decrease in diameter, followed by a conical restriction and diverging outlet.

The reduced area at the cone entrance, together with the design of the annular throat, induces the high differential pressure obtained; the diverging outlet cone provides high recovery of differential pressure.

Martenet Process Available

Link-Belt Co., E. Rauh & Sons Fert. Co. and Simon J. Martenet have developed the Martenet process for production of granular fertilizers, and it is now available to the industry, offered exclusively by Link-Belt.

Formulation of all ratios of fertilizers is possible, using anhydrous ammonia, ammonium nitrate and other high grade materials. As a result of close control in the process, the product is granular, homogeneous and free flowing.

Storage curing is not required so that inventory of material is reduced to effect savings in expense of storage facilities. Complete new plants can be designed and installed or existing facilities can be converted. For information circle 247 on Service Card.

Valve for NH_3 Tanks

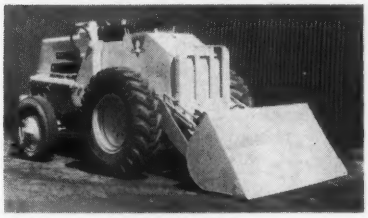
S and L Manufacturing Co. has produced a new anhydrous ammonia forged steel hand-operated 1¼ inch NPT combination liquid fill and withdrawal valve, Number 2690. Through new techniques in construction, the company says the valve permits greater, faster flow of liquids with far less back pressure and turbulence.

The company has also added to its anhydrous ammonia line the forged steel ¾ inch NPT hose line valve No. 2696.

Latest Trojan Loadster

Contractors Machinery Co. has added a ¾ cu. yd. struck measure loader to its line. The Model LH-75 Trojan Loadster features elimination of all clutches, direct drive through a torque converter coupling to the transmission and four working speeds, plus a high speed traveling range.

A gear-type reversing mechanism provides the full range for forward or reverse



LH-75 Loadster

travel. The model loads over the drive wheels with load weight used to provide extra traction which, with the torque multiplication provided by the converter, produces a powerful surging crowd.

For literature and name of your nearest dealer, circle 248 on Service Card.

Electronic Metal Detector

An Electronic Metal Detector, built in two basic types for general industrial service and for deep burden service, is being produced by Dings Electronics, Inc., a subsidiary of Dings Magnetic Separator Co.

The new detector, which embodies "ultra high sensitivity," is sensitive to all metals, and is said to detect even minute particles, signaling their presence and protecting machinery and product quality against tramp metal damage.

A wide range of signal and reject system arrangements is available for use with the instrument, to provide automatic detection with manual, semi-automatic or fully-automatic rejection of tramp metal. Included are arrangements for handling both bulk and packaged materials.

Hypro Liquid Fert. Pump

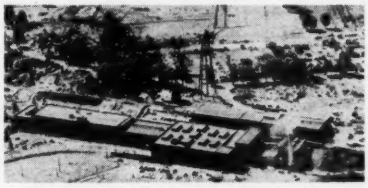
Corrosive liquid fertilizers can be handled effectively with the improved Model 750 direct drive tractor pump, according to Hypro Engineering, Inc.

Designed with stainless steel seals and stainless steel inserts in the nylon rollers, the new Model 750 with type 2 Ni-Resist case and rotor contains no copper and shows great resistance to wear. The pump has a pressure range of from 0 to 350 pounds per square inch and delivers approximately 15 gallons per minute at 600 RPM, 0 lbs. pressure, and 11 gallons per minute at 150 lbs.

Suppliers' News

American Tractor Corp. (TerraTrac) has secured $500,000 in additional working capital to provide for expanding sales. The company produces a line of gasoline and diesel crawler tractors.

A fourth bag-making plant has been acquired by **Arkell & Smiths.** The latest addition is a Hudson Falls, N. Y. plant



formerly operated by Union Bag & Paper Corp. Union will continue to act as a selling agent for the plant according to the agreement.

The Ellman Equipment Co., Cincinnati, O., has been appointed representative in that area for **Beaumont Birch Co.**

First place in sales in a nationwide Junior Achievement competition was won by the Nova-Mat Co., a J-A group sponsored by **Bemis Bro. Bag. Co.** With a membership of 23 St. Louis area high school students, Nova-Mat sold as its principal product a selection of absorbent, lint-free rayon dish towels (purchased from a Bemis mill) packaged in polyethylene plastic bags, from Bemis' Plastic Bag Dept.

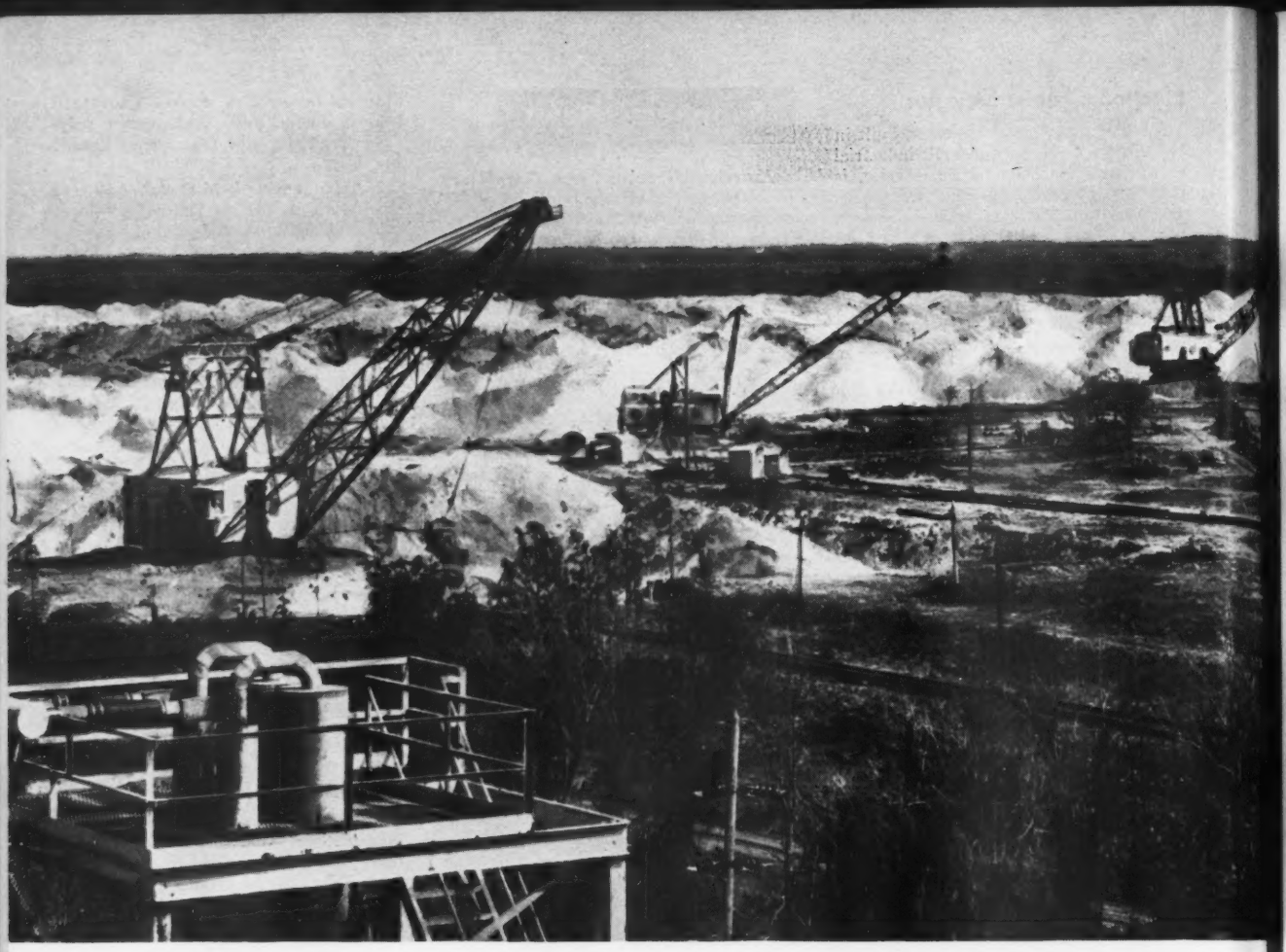
Nova-Mat record: 26 shares of 50 cent stock; returned full investment plus 10 per cent dividend; donations of doll houses to the Shriners Hospital for Crippled Children and seven cases of food to a drought stricken area of Missouri.

Chase Bag Co. has announced plans to increase and expand paper bag production. Addition of over $400,000 worth of multiwall producing and printing equipment to Chase's Minneapolis branch will make it the company's third multiwall bag installation.

Labor troubles at the **Schutte & Koerting Co.** have ended, and special efforts are being made to process orders on books.

The Atlantic branch office of **Richardson Scale Co.** is now located at 423 Grant Bldg. E. C. Mott continues as manager. Richardson has established a new branch at 211 ½ Court Ave., Memphis, Tenn., headed by Gus Baurnfind, with a territory covering Arkansas, Mississippi, Louisiana and parts of western Tennessee.

St. Regis Paper Corp. reports that its New Orleans Multiwall Packaging Div. office is now located at 307 Carondelet Bldg. Herman Haberle continues in charge.



Three of the A.A.C. Co's electrically-operated draglines at work at our phosphate mines in Central Florida. Bucket capacities range from 9½ to 17 cubic yards. The 17-yard draglines with their 175-foot booms each weigh more than a million and a half pounds and can move 35,000 tons of material in 24 hours. From these rock deposits flow a continuous stream of high quality phosphate rock, assuring a dependable source of supply of AA QUALITY phosphorus products, see list below.

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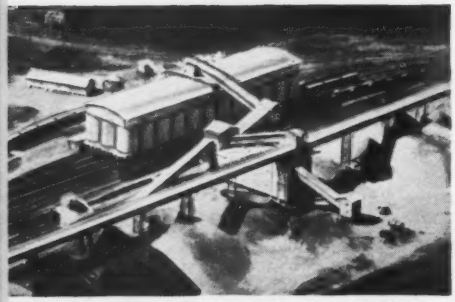

From the air—wet rock storage and drying plant, with dry rock storage silos in background. These silos, 29 in number, have a total capacity of 40,000 tons of dried rock. Under the silos are four runways where 40 railroad cars can be loaded at a time.

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Washington Report

By Fred Bailey & John Harms

Investment opportunities for American insecticide and fertilizer industries in foreign countries are booming, according to officials of the Foreign Operations Administration. Investigators for FOA's Office of Trade, Investment and Monetary Affairs have found that the "investment climate" for these industries is improving rapidly in many countries. . . with adequate guaranteed safeguards for investments.

12 countries are reported as listing fertilizer as their most serious economic need. These are: Burma, Colombia, Dominican Republic, Egypt, El Salvador, Honduras, Indonesia, Iran, Peru, Saudi Arabia, Thailand and Turkey.

Three countries in need of insecticides and insecticide plants are Turkey, El Salvador and the Dominican Republic. Chemical industries of non-agricultural types are being sought for Austria, Belgium, Chile, Colombia, France, Israel, Jordan, Pakistan, Turkey and Spain.

A little-known recent development, FOA men point out, is that many of the big risks formerly associated with foreign investment have or are being overcome. Many of the countries listed have signed agreements guaranteeing U. S. investors (1) convertibility of currency and (2) expropriation.

In addition, former director of the Office of Trade, Investment and Monetary Affairs, Ellsworth B. Buck, played a key role in getting UN members to sign a resolution outlining the essentials of a good "investment climate." This step alone is a long one toward assuring equality of foreign and domestic investors and setting up attractive incentives for U. S. industries.

FOA officials are ready to give the "red-carpet" treatment to industries interested in foreign investment. Officials point out that this is the first time that such a service is available on the government level. Any industry interested in looking over the possibilities is advised to send a representative to Washington to get the facts. A bull-pen of specialists has been set up to talk "turkey." Address: Office of TI & MA, FOA, 806 Connecticut Ave., N.W., Washington 25, D. C.

Now that the Miller pesticide bill has become law, watch for an industry-government conference to work out understanding of mutual problems that will have to be ironed out before the new program gets underway. The conference, requested by the chemical manufacturers, is designed to provide Food & Drug Administration with industry's views on numerous problems, including the matter of fees to be charged.

The fee provision in the Miller amendments to the existing law, tacked on at the last minute by the Senate, authorizes F&DA to call on industry to underwrite the cost of the tolerance-establishing program. The provision does not, however, prescribe a fee formula.

The fee program which we expect F&DA to set up, will be along the lines of current certification programs. For example, a manufacturer will be asked to make an advance deposit, say $500. The cost of the government's work involved in providing the tolerance will be totaled up at the end. If it cost, say $300, to establish the tolerance, the manufacturer gets back the rest, or $200. If it cost more than the deposit, the manufacturer would have to make up the difference.

Farmer loans for fertilizer and other so-called "annual" practices were a possibility as we went to press. The House Agriculture committee had added a provision to the Water Facilities bill to permit the Agriculture Department either to (1) make direct loans to farmers for annual practices, or (2) insure loans made by private lending institutions. This could be the most far-reaching conservation action taken by Congress this year and one of the important legislative items of interest to the fertilizer industry.

The Water Facilities bill, which would expand a loan program for farm installation of such facilities as ponds and windmills, stood a good chance of passage.

Loans under the annual-practice amendment would be obtainable from the Farmers Home Administration through mortgages on upcoming crops. Security for permanent-type practices would involve land liens. Interest rate would be 3 per cent or slightly higher.

Federal payments for fertilizer and lime applications will again be made in 1955 under the combined ACP-diverted acre program. Next year's conservation payment program will be bigger—composed of $195 million in regular ACP funds and $55 million set aside specifically for helping farmers build soil fertility on land taken out of controlled crops.

The total fund will be paid out to farmers roughly along the same lines as in past years. No special payment is now contemplated for diverted land alone—payments for practices on those will be calculated on the same basis as for the ACP program.

A proposed change in the "fair price" rule in the ACP program was gathering strong support at press time in the Congress. The Senate Agriculture committee went on record in favor of making authority for setting "fair prices" permissive instead of mandatory.

Under the present system, suppliers of fertilizer, lime and other materials used in the conservation program must agree to charge farmers not more than a "fair price" established by the county USDA committee.

Headed for congressional approval at press time was a bill that would allow farmers to deduct conservation expenses on Federal income tax returns. The bill is specific on what costs could be taken off taxable income, including such things as grading, terracing, contour furrowing, water channel work, dams, eradication of brush and planting of windbreaks.

"Annual" practices, such as fertilizer and liming, are not included. . . no tax deduction for their use. Question that still wasn't answered was whether farmers could deduct the cost of using chemicals in the eradication of brush.

Farm production controls in 1955 are expected officially to have a decided impact on sales of fertilizer, pesticides, farm equipment and other items farmers buy. Official word is that these industries can expect to sell less to agriculture. . . although the government has very little idea of how much less.

This forecast is based on analyses of the economic effects of the most stringent farm production controls ever imposed by the government. Officials say that close to 15 per cent of all cropland may eventually be forced out of cash crops. . . out of crops that require fertilizer and pesticides. Farm income decline next year now is unofficially forecast at as much as 10 per cent below last year's level.

Cotton, big consumer of both fertilizer and pesticides, is in line for the biggest jolt under controls next year. House Agriculture committee estimates a cotton income cut of $1.2 billion from 1953 when USDA's plan to cut plantings to about 18 million acres goes into operation. That's about 42 per cent less income.

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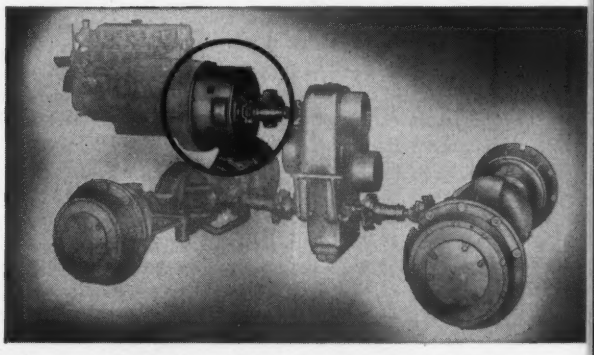

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Pacific Branch, ESA Meet Draws Large Attendance

By Chuck Starker

SOME 200 entomologists and their families from the western United States, Canada and Hawaii gathered at Bend, Ore., June 22–24, for the second annual meeting of the Pacific Branch, Entomological Society of America.

Invitational papers on "A History of Pacific Coast Entomology," "One Hundred Years of Insect Control by Chemicals," and a panel on "Entomology in the 'Roaring Twenties' " well carried out the theme of the Centennial year of entomology. In addition to the regular program of submitted papers, panels on the use of soil insecticides and integration of laboratory and field research methods were included.

BEPQ Reorganization

First speaker on Tuesday, June 22, was Dr. E. F. Knipling, head, Entomology Research Branch, USDA. In his discussion of the recent reorganization of the bureau, Dr. Knipling used slides to illustrate the transition from the old bureau set up to the present eight sections of bee culture and biological control, fruit pests, cereal and forage crop pests, identification and importation of parasites, insecticides, insects affecting man and animals and truck crop pests.

The separation of forest insect work from the bureau was a decided loss, as was the removal of the section on stored products pests, which was placed in a section separate from the entomology research branch.

All the changes have not been on the debit side. At present, certain of the research men are now able to work closer to host crop research programs than they did formerly and enjoy better cooperation and coordination in their special fields, with excellent leadership. Changes in the old bureau were mainly shifts at top level, with Federal-state relationships still about the same.

President's Message

Dr. H. H. Ross, president of the Entomological Society of America, stated that the membership of the society is now in excess of 3,000 and it is hoped the number will be raised to 4,000 before long. He indicated that a well-informed membership is essential for workers in the field of entomology. With that thought in mind, the organization now has a home office in Washington, D.C., and a permanent secretary.

With the present rapid strides in the field, Dr. Ross noted the need for regional and national meetings is now greater than ever before. A more efficient publications set-up is needed, as well as a more profitable advertising campaign and a more rapid and prompt publication of papers. By 1955 a bi-monthly bulletin is planned to be sent to all ESA members. A new venture, the ANNUAL REVIEW OF ENTOMOLOGY, should be in press by 1956.

West Coast Entomology

"Entomology as a science was slow in developing in the West," stated Prof. E. O. Essig, University of California, in speaking on the historical side of entomology on the West Coast. He mentioned the first collectors were fur seal traders. Beetles were their specialty, as these were less fragile than other insects. Later workers were mentioned, as were some of the early insecticide materials.

When lime-sulfur and lead arsenate were found to be effective on certain pests they were used quite extensively and were the main standby materials for some 50 to 60 years, until the arrival of DDT and other chlorinated compounds. Prof. Essig stated the task of the entomologist of today is a hundred times more complicated than formerly, what with residue problems, legislation, labeling and numerous other headaches.

Dr. E. F. Knipling (right), head, Ent. Res. Branch, USDA, presents certificates for 40 years' work in entomology to R. E. Campbell (center) and E. J. Newcomer (ext. left).

Stanley Strew, Chipman Chemical Co., Palo Alto, Cal., with H. C. Swab, Atlas Powder Company, San Francisco.

Roy E. Campbell, Ent. Res. Branch, Whittier, Cal. and John D. Steinweden, chairman-elect, Cal. Dept. of Agr.

Dr. B. G. Thompson, Oregon State College, in discussing his experiences in Iran, stated locusts are rather a minor pest there, when compared with some of the other insect problems which are less publicized. Wheat is their chief staple crop, and a single insect, the sandpest (a Pentatomid), cuts wheat yields an average of 20 per cent each year. Use of DDT at high levels failed to control this pest.

On citrus alone, six different species of scale insects were noted. Their orchards are heavily interplanted which makes pest control a difficult proposition and the application equipment for sprays is quite primitive in nature.

Migratory locusts were quite a problem, and during 1951–53 the worst outbreak in 300 years was experienced. One species of migratory locust occurring in that area is able to produce five generations per year under favorable conditions, and follows the monsoons across the Middle East.

In 1952, control measures aimed at the break-down of this cyle were set up; 100 ten-man crews were used to spread bait in the infested areas. Spot-spray applications by spray planes were used to clean up skipped areas, and the cycle was broken.

Spruce Budworm Parasites

A recent study made by the Pacific Northwest Forest and Range Experiment Station on 3,000,000 acres sprayed with DDT for control of spruce Budworm showed that three to four years after the DDT applications, spruce budworm parasites were most abundant on sprayed areas, and survival of parasites after spraying now gives better control of the bud moth than formerly.

Chemicals in Soil

Harry Lange, University of California, discussed studies on incorporation of lindane, aldrin, DDT and dieldrin in the soil by means of discing, rototilling and harrowing. In their area, the highest concentrations of chemicals were found in the upper 2½ inches of soil—about 40 per cent with some materials. Both chemical and bio-analytical methods of residue determinations were used.

Work at the Irrigation Experiment Station, Prosser, Wash., on soil residue studies was described by E. C. Klostermeyer who told the group early troubles with arsenical residues led to current regional studies on soil residues of chlorinated compounds. Work underway at Prosser since 1949 is similar to that carried on in five other sections of the country using the same test plants and insecticides as at Prosser, but with different soil types and cultural conditions. Soil type is a virgin sandy loam plowed out of sagebrush.

Insecticides used were DDT, BHC, lindane, chlordane and aldrin. The wettable powder form of each material was used, and after being well mixed with sand, it was rototilled into the individual soil plots to a depth of six inches. Each year soil samples have been taken and chemical analyses made. Black Valentine beans and Abbruzzi rye have been the best plant indicators.

DDT at the 10 pound level has given some depression on beans; at the 119 pound level it still gives severe depression at the end of five years. BHC at three pounds had no apparent effect on beans the first year after application, but did affect certain other crops. At 15 pounds, soil sterilization resulted. Chlordane at high levels (75 pounds) gave some depression the first year, but none thereafter. Aldrin at three pounds gave no depression, but at the 60 pound level depression resulted for four years.

High rates of DDT stimulated cheat grass, and potatoes planted in the high rate DDT plot were selectively fed upon by mites and killed, while the same variety of potato planted in a non-DDT treated plot next to the one attacked was not molested by the mites. Maturity level of certain crops was delayed in the high level DDT blocks.

Klostermeyer stated that certain of the chlorinated materials have been shown to be quite stable in the soil, with the soil type affecting crop response to these high levels of chemical used. Adverse effects are most pronounced in soils low in organic matter.

Soil Insecticide Panel

Insects inhabiting the soil can be classified by habits into persistent (as wireworms), non-persistent (cutworms) and those which come in after the crop is planted (seed-corn maggot), Harry Lange, panel moderator, told the group. He also stated foliage feeding pests may have stages which later go into the ground.

The most important soil pests listed by H. E.

Morrison, Oregon State College, were white grubs, wireworms, corn root worm, root maggots, carrot rust fly, root weevils, flea beetles and false wireworms. Control measures employed include poison bait, milky disease, fumigants and use of residual insecticides in the soil.

Soil insecticides and fumigants were discussed by Dr. L. C. Glover, Shell Chemical Corp. Fumigants such as D-D for nematodes and ethylene dibromide for wireworms have been used extensively in California. At present, considerable methyl bromide is being used under plastic covers.

For general broadcast use, DDT at 10 to 20 pounds per acre is still the standard material. On certain soil pests it has given control for nine years. Chlordane is another material used extensively as a soil insecticide.

Aldrin at a rate of two to five pounds technical per acre has given one full year of protection. Heptachlor parallels aldrin closely, the chemical nature being about the same, with a similar residual. Dieldrin usually requires less active material than aldrin, but gives a better residual, according to Glover.

Lindane, although still used as a soil insecticide, has given flavor alteration of many root crops. Isodrin, while about equal to dieldrin in action, is not too readily available and is more expensive. Although it is not used too much as a soil insecticide, toxaphene at 20 pounds technical gives a residual similar to that of dieldrin.

Some of the problems caused by application of insecticides to the soil include depression of plant growth, and interference with normal soil fauna. The amount needed for effective insect control may produce flavor alteration, or poor quality which is most pronounced on root crops, Klostermeyer stated.

H. E. Morrison, Oregon State College, mentioned that plants can also be stimulated by the admixing of formulations of different materials in the soil. He questions that the soil will be permanently contaminated with high dosages of insecticides. His opinion is that certain materials decline rather rapidly in the soil. Aldrin, for example, is gone in two years, but effective insect control, as measured by bio-assay methods, can still be attained in that same soil.

DDT Buildup

Work in Washington state indicates the possibility of a buildup in DDT in certain orchards. A level of 100 pounds technical per acre has been found, but this is the highest of many sampled. These deposits have been found in the top three inches of soil, which is down to the depths of cultivation. Some loss of chemical has occurred, and what remains apparently has no effect on the cover crop.

DDT residues fall off rather rapidly during the first three years in the soil and then appear to level off. DDT at 25 pounds technical per acre decreased in eight years, with only 44 per cent of it remaining at the end of that time. The rate of DDT deposit in the soil at present is less than when the material was first used, because at first growers made the same number of DDT applications as they did under the lead arsenate program—three to four covers; now they are down to one or two per year.

Length of residual action in the soil is dependent upon chemical used, rate, method of application and the formulation, Morrison stated, in discussing his work in Oregon on small plots using a rotary tiller for incorporation of soil insecticides. Shallow mixing gave effective pest control for two to three weeks, with deeper mixing giving control for longer periods. Excessive mixing is not desirable, and will bring the insecticide to the upper soil level.

Work with aldrin, dieldrin, chlordane, heptachlor, endrin, lindane and toxaphene at the Citrus Experiment Station was summarized by M. H. Frost of the station. Chemicals were disced down to a six inch level. On the basis of their first years' activity, researchers have classified soil insecticides into the following categories: 1. quite persistent—DDT, dieldrin; 2. medium persistence—toxaphene, chlordane; 3. rapid release—aldrin, lindane, heptachlor.

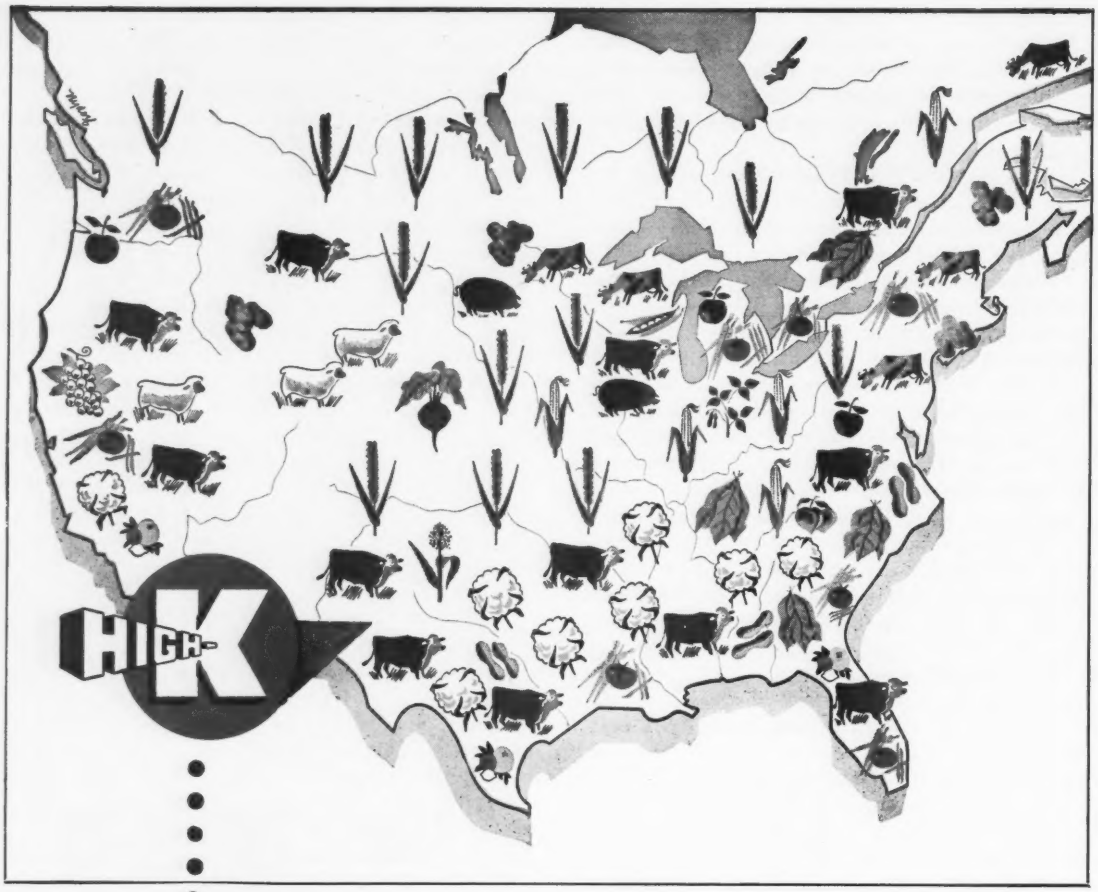
H. E. Morrison told the group the decline of insecticide materials in the soil may be caused by soil organisms or by other factors such as organic matter, soil *p*H, particle size, temperature, drainage and soil moisture.

Granular Formulations

Granular insecticide formulations were designed principally for use in fertilizer mixes, but may also be effective when flown on pasture areas, said C. E. Miller, Colloidal Products Corp. Canadians have used large quantities which were applied over a snow cover for later control of mosquitoes.

R. W. Every, Ext. Ent., Oregon State College, explains 4-H Club Exhibit to Miss Gay Hitchcock, Portland, Ore.

Keith Sime, Chipman Chemical Co.; Edythe Sime; R. D. Eichmann, Stauffer Chemical Co. and Jennie Eichmann.



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Although most granules are not too uniform in size, results apparently are up to the expectations of their users. Fuller's earth and bentonite are the two most popular types of carriers used. Bentonite breaks down rather rapidly in the soil and will not retain in excess of a 5 per cent concentration of toxicant. Fuller's earth is used for the higher concentrate formulations. A screen size of 30/60 mesh is the most popular.

The reported difficulties with toxicant breakdown on granules have not been exaggerated. The causes for this situation are imperfectly understood. At times the breakdown can be rather rapid. It is claimed by some that surface activity on the granule is responsible, and that a neutral granule surface is needed so the effect of the chemical is not lost.

In summing up the information on insecticide granules, Miller said that they are a special purpose product, designed for situations where safety of material or placement is the primary objective in selection of the formulation to be used.

Mrs. Lois Sather of the Food Technology Dept., Oregon State College, outlined organoleptic tests performed there. She stated BHC in 1947 triggered flavor studies on potatoes. These have now been extended to include all insecticides used in the soil.

Two panel groups are used in their work, and their program is now planned so that flavor evaluations may be made early in the field use of new experimental materials. They are set up so that after harvesting, the crop can be processed and stored in their own pilot processing plant. Their facilities also include a kitchen where samples are prepared for the panel. Thus known conditions prevail from the time the crop is planted, through harvesting, until it is actually sampled by the panel.

To date, one material has come up with a black mark against it, lindane at the three pound rate. On fresh produce it often did not show up, but when these same crops were cooked, the heat brought out the lindane flavor.

1955 Meetings in South

It was announced at the annual business meeting the 1955 meetings would be held in Riverside, Cal., with headquarters at the Mission Inn, during the third week of June. Officers elected were chairman, John D. Steinweden, State Department of Agriculture, Los Angeles, Calif.; vice-chairman, Walter Carter, Pineapple Research Institute, Hawaii and Leslie M. Smith, University of California, Davis, secretary-treasurer. Dr. Larry A. Carruth, Entomology Department, University of Arizona, was named to the Executive committee.

Program chairman for the meeting was Dr. Paul O. Ritcher, Oregon State College; Arrangements, R. D. Eichmann, Stauffer Chemical, Portland; Registration, O. B. Hitchcock, U. S. Industrial Chemicals, Portland and Operations, R. W. Every, Oregon State College.

Members and guests enjoyed an informal get-together the night of June 21st, and the next morning some 135 drove out to the Hollinshead Ranch for a Buckaroo Breakfast put on by the Rim Rock Riders. A capacity crowd enjoyed the annual banquet at the Pilot Butte Inn, and entertainment by the "Swiss Family Fraunfelder," with dancing after the banquet and entertainment. ◆

Antibiotics Promising As Crop Pesticides

INTEREST in the use of antibiotics as plant bactericides was heightened recently when it became known that Chas. Pfizer & Sons had distributed enough of a streptomycin-terramycin combination to treat about 100,000 pear and apple trees for fire blight.

Named Agrimycin, the new type pesticide will probably be marketed if results are up to anticipations. In tests against the fire blight, Missouri researchers have found that a spray containing 100–500 parts of this combination fungicide per one million parts water provided control of the bacterial disease.

In California, crude streptomycin was applied as a bentonite dust containing 240 ppm of antibiotic, under field conditions, at the rate of 30 pounds per acre to 25 year old Bartlett pears. All treated plants were said to show remarkable control.

Prof. P. A. Ark, University of California, has reported that despite the fact that the streptomycin dust could not be applied at the most critical time in these tests, fewer applications than with copper lime dust provided equal performance. Fruit from the copper-lime plot was heavily russeted and that from the streptomycin treated area was clean.

In experimental work, USDA workers have found that Halo blight of beans, previously considered incurable, can be stopped and prevented with a water spray containing 1 per cent streptomycin sulfate.

Other applications of streptomycin as tested in California laboratories, included use against walnut blight, tomato canker, bacterial canker of stone fruit, angular leaf spot of cotton, crown gall, olive knot, bacterial spot of begonias and bacterial spot of stone fruit.

Prof. Ark reports that the performance was good in all tests and that gram positive species of bacterial diseases were found definitely more susceptible than gram negative forms. It is interesting to note that the former can be represented by tomato canker and the latter by fire blight.

In addition to control of bacterial diseases affecting cotton and tomatoes, possible forthcoming developments also include the use of antibiotics for protection of other commercial crops such as peaches, spinach, lettuce and tobacco. ◆

Liberty Mfg. Features Service

George Ashford talks with a customer. Discussing individual fertilizer requirements is a principal point in Liberty Mfg.'s customer relations program.

Liquid Nitrogen Service Now Well Established, Plans Entry Into Home Garden Fertilizer Market

By Dick Brown

THE spring fertilizer rush was on, and the office force at Liberty Manufacturing Co. in Red Springs, N. C., was hard pressed to keep up with the flood of orders.

An Indian farmer, from nearby Pembroke, sidled nervously up to the counter, his natural shyness heightened by the activity. After a few minutes' wait he caught a secretary's eye.

"May we help you, sir?" she asked.

"Yes'm; I want to buy a little fertilizer," he answered.

"That's fine; Mr. Ashford will see you in just a minute."

The farmer, nervously fingering his hat, was ushered into the office of George Ashford, Liberty general manager since 1937. There he listened intently as Ashford, taking time out from the press of other work, carefully discussed his fertilizer needs.

In simple, understandable language the general manager explained what each crop was taking from the soil and the analysis best suited to replenish this plant food. Before leaving, the visitor had learned the advantages of certain mixtures for his particular farm and had been brought up to date on the latest information from experiment stations and the state extension service.

As he walked out, after placing a small order in line with the recommendations, the farmer said, "You know, Mr. Ashford, this is the first time in the 20 years I've been buying fertilizer that anyone like you has ever bothered to do more than write up my order."

"It only took about 10 minutes," Ashford explained later, "but it was well worth it. That man felt good when he left this office, and I believe he'll be a Liberty customer for a long, long time. True, he only owns a small farm and his business may not amount to much, but we believe it's vitally important to show a personal interest in every farmer, large or small, who comes by.

"Sure we want their business, but primarily we want to help. We want to suit the fertilizer to the farmer's needs, rather than sell anything, and we're finding every day that it pays off in dollars and cents."

This tale of the Indian farmer is a typical example of how a well-rounded, carefully planned customer relations program is steadily winning new friends and customers for Liberty, a 10,000-ton per year plant which was founded in 1906.

No stone is left unturned to keep the program in the forefront. Every member of the staff is available at any time to talk to farmers and advise them in any way.

Year Round Program

The program is not a seasonal proposition, but operates the year round. The latest information on vital farm topics is passed along by word of mouth and through LIBERTY NOTES, a mimeographed news

Overall view of Liberty's plant at Red Springs, N. C.

letter which is mailed to several thousand farmers at least once a month.

It contains market information, the latest material on farm practices, long range weather forecasts and newsy items about individuals and their crops.

The firm maintains its own fleet of lime and fertilizer spreaders which is always available for custom application work at actual operating cost.

This machinery, Ashford pointed out, is kept strictly for the convenience of customers, and has enabled many farmers to take advantage of government conservation aids they would otherwise have missed.

Soil sampling is another service in constant demand. Samples are sent to state laboratories for analysis, and the information obtained is of great help in recommending a balanced fertilizer diet according to the needs of the individual farm.

At harvest time Liberty keeps farmers posted on latest market prices and is always ready to lend a hand in the actual marketing. The office force is also available to aid in filling out necessary papers for loans on support crops like cotton.

"We try," Ashford said, "to keep abreast of the latest developments in agriculture, particularly in the use of chemicals, and are always anxious to pass this information along. We stock some insecticides for the convenience of customers and offer advice on insect control

Seed Cleaning & Treating

"Another feature that has proven valuable is our seed cleaning and treating plant. We can handle all types of seed, and these facilities are used heavily during the weeks preceding planting time."

The 10,000-ton per year capacity figure does not begin to tell the Liberty story. The company has pioneered the use of liquid nitrogen and anhydrous ammonia in its area with a resulting healthy increase in total sales.

Actually the Red Springs firm was the first in the United States to promote the use of NFS-60 liquid nitrogen solution. That was in 1952, and Ashford, President Edwin Pate and other officials were so enthusiastic about the new product that they made a special trip to New York to discuss its possibilities with Allied Chemical and Dye Corp. officials.

Use of the chemical has really snowballed since that time. Liberty sold 40,000 gallons of NFS-60 the first year, and this season distributed approximately 1,000,000 gallons, plus some 50,000 gallons of Solution 4 liquid nitrogen for row crops.

"We started several years ago with anhydrous ammonia," Ashford explained, "but switched emphasis to the liquid for several reasons—mainly because it is easier to apply and is less hazardous.

"Since going into the liquid nitrogen business on a large scale," he continued, "we have confirmed several important facts about it and improved our applicating equipment.

"We know that it is more economical than solids, and that the farmer gets more even distribution and quicker response. Then, too, and this is purely an observation, liquid nitrogen seems to produce better drought resistance. I don't know why, but that has been the general rule in this area.

Equipment Improvements

"By the trial and error method we have made numerous improvements in applicating equipment. We now use plastic in place of metal within the boom extension because it is lighter and more flexible.

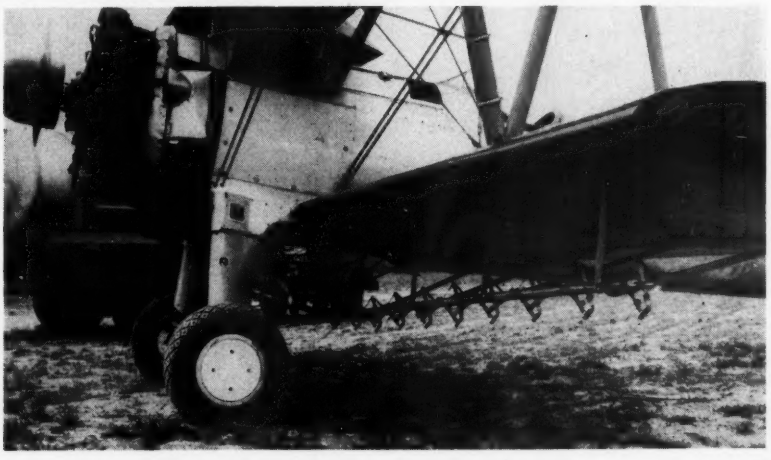
"For tractor application we use a John Blue positive displacement pump with an 80-gallon aluminum tank. Stainless steel nozzles are used, and no material subject to corrosion is allowed in contact with the chemical.

"No pressure is required in handling the material, but it must be kept at all times under a constant heat of 100 degrees because of its high salting-out point (47° Fahrenheit)."

Customer response to liquid nitrogen has been nothing short of sensational, judging from sales figures, and has resulted in other interesting observations.

"Our experience shows," Ashford said, "that farmers will use more nitrogen per acre with liquids than solids. This increases their yield, but at the same time increases the need of the land for other plant foods. Here again we work closely with the

LEFT: Jack Reynolds and the plane he uses to apply liquid N to small grain and pasture. Flying this "souped up" Stearman, with special uplift wings, he can cover about 50 acres an hour. RIGHT: Spray apparatus on Reynold's plant for liquid N application. Tank is located in fusilage, and pilot can control flow of liquid from cockpit.



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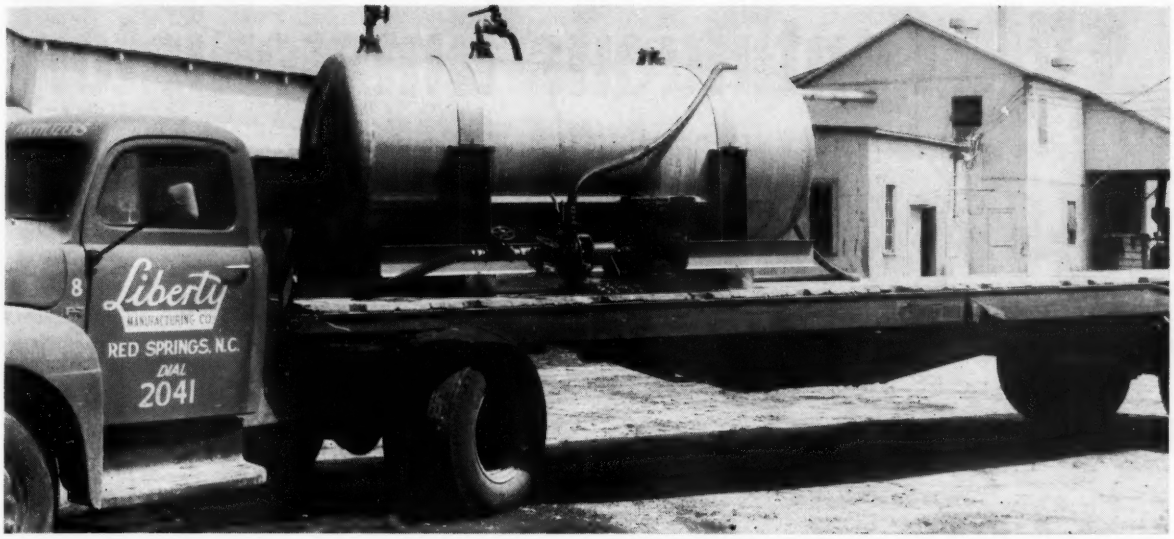


This truck-mounted tank with 1,000 gallon capacity is used to deliver liquid nitrogen to farmers.

customer, pointing out these facts and recommending a proper diet to overcome any deficiencies that occur."

Nitro-Green for Lawns

With liquid nitrogen established on a solid foundation in its immediate sales area, Liberty is now preparing to market the product in a new form with an eye to the home garden market. The new product bears the trade name Nitro-Green, and is designed for lawn use.

It will be marketed on a nationwide scale in one-gallon jugs. Nitro-Green is already mixed and may be applied to grass with a regular garden hose, sprinkler or similar device.

Advertising and display material has already been prepared, and final details of the sales campaign are expected to be worked out in the immediate future.

Liberty operates a fleet of six tractors for liquid nitrogen application, and 90 per cent of its sales are on a custom application basis. Material is stored in a 12,000 gallon aluminum tank, furnished by R. D. Cole Co., and delivered to customers in 1,000 gallon truck mounted tanks made by General Metals Co.

In addition, the firm operates a branch outlet with Dixie Guano Co. at Statesville, N. C., under the name Dixie-Liberty Plant Foods, Inc. This installation includes a 25,000-gallon aluminum storage tank manufactured by Richmond Engineering Co., Richmond, Va.

Airplane Application

This year, for the first time, Liberty tried liquid nitrogen application by airplane with excellent results. The plane, hired on a contract basis, was able to cover an average of 50 acres per hour, compared with approximately four acres for a tractor. The cost of application was approximately the same.

"The plane," Ashford stated, "could operate in almost any type weather, eliminating the time loss encountered by tractors during wet spells. It looks like the most economical method, but a lot of farmers will continue to use tractors.

"Either way," he continued, "it fits into our overall customer relations program because we can furnish either method for custom work.

Unloading liquid N from tank car to portable tank.

"We've come a long way in the past few years, but we're constantly striving to do a better job of selling the customer—not necessarily on Liberty products, but on the necessity for using the right kinds and right amounts of fertilizer and on following the latest scientific practices.

Proper Emphasis

"One of the greatest needs of the fertilizer industry today, as I see it, is to emphasize quality rather than price. If a particular fertilizer is not exactly right for a man's land, he has no business buying it even if he can save a few cents.

"We point that out. Most farmers appreciate your working with them, and certainly gain unlimited confidence in your firm when they find you have their best interests at heart and are not merely trying to sell another ton of fertilizer.

"We try to offer our customers every possible service and piece of information, because we know that our business will sooner or later suffer if their land doesn't produce the crops it should."

All of Ashford's remarks and observations, tied together, spell CUSTOMER RELATIONS in capital letters, and offer material that has been tried and has proven of untold value in building sales. ◆

TVA Continuous Ammoniator

For Superphosphates and Fertilizer Mixtures

By L. D. Yates, F. T. Nielsson,[1] and G. C. Hicks

Tennessee Valley Authority
Wilson Dam, Alabama

PART II

Mixtures and Solutions

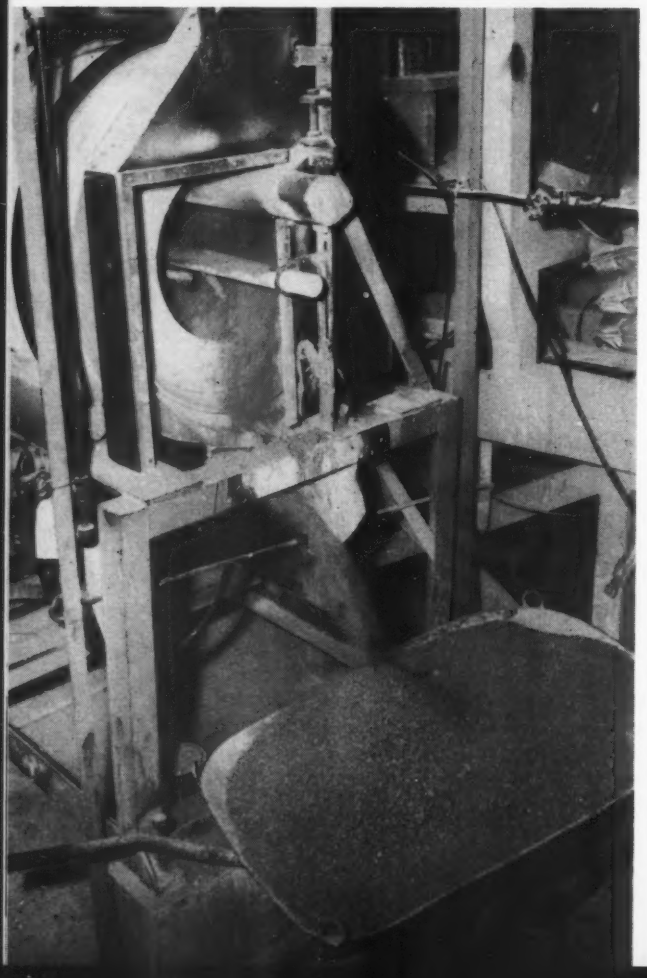
NO tests were made of the ammoniation of ordinary superphosphate alone. It was decided that information on the ammoniation of mixtures containing this superphosphate would be of more value. For these studies a mixture of ordinary superphosphate and muriate of potash in which the weight ratio of K_2O: available P_2O_5 was 1:1 was chosen for study. The 3- by 3-foot ammoniator and the distributor shown in Figure 5 were used in these tests. The tests were made at feed rates of one to five tons of solids per hour (retention time, 10 to 2 min.) and at different degrees of ammoniation. The compositions of the nitrogen solutions (X, Y, Z) prepared and used for ammoniation are given in Table II together with the designations for equivalent solutions available on the market.

The results of tests at one ton per hour (9.6 min. retention) with solutions X, Y and Z are plotted in Figure 6. Losses of ammonia were less than 2 per cent when the

[1] *Present address: F. S. Royster Guano Co., Norfolk, Va.*

See page 41, July, 1954 FARM CHEMICALS.

View of discharge end of TVA's continuous ammoniator.



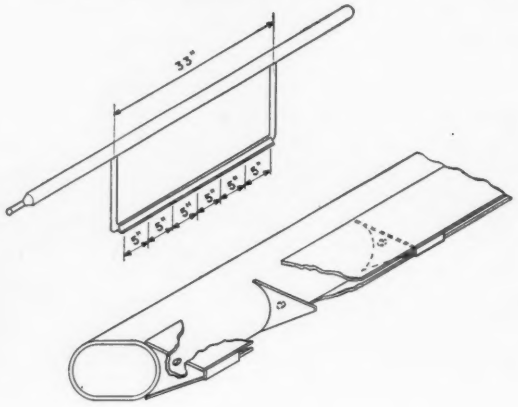


FIGURE 5
DETAILS OF CONSTRUCTION OF AMMONIA DISTRIBUTOR

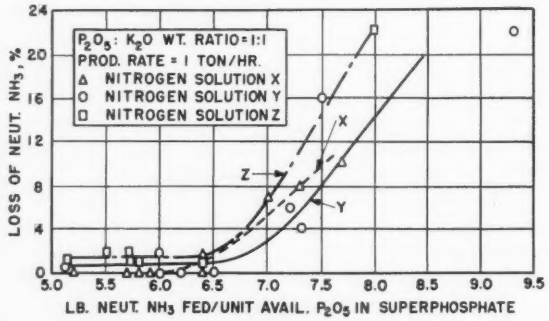
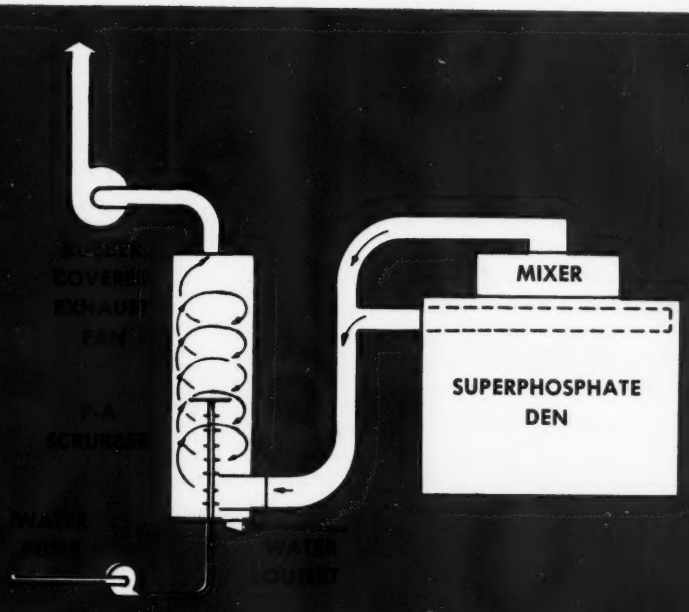


FIGURE 6
EFFECT OF DEGREE OF AMMONIATION ON AMMONIA LOSS: ORDINARY SUPERPHOSPHATE AND MURIATE OF POTASH

REMOVES 98% OF FLUORINE

from Superphosphate Plant Exhaust Gases

CHEMICO P-A CYCLONIC SCRUBBER



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total amount of neutralizing ammonia fed did not exceed 6.5 lb./unit of available P_2O_5 in the superphosphate fed. The curves break between 6.5 and 7 pounds of neutralizing ammonia; it is believed that reactions 6 and 7 take place in this range of ammoniation.

Figure 7 shows that decreasing the retention time from 9.6 to 2 minutes by increasing the rate of production from one to five tons per hour increased loss of ammonia only slightly.

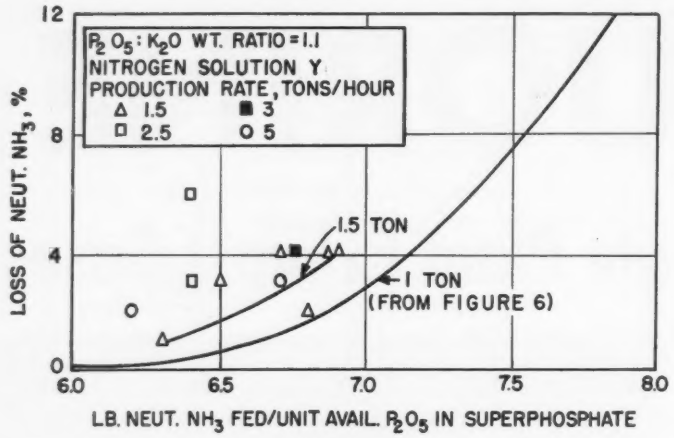


FIGURE 7

EFFECT OF PRODUCTION RATE ON LOSS OF AMMONIA: ORDINARY SUPERPHOSPHATE AND MURIATE OF POTASH

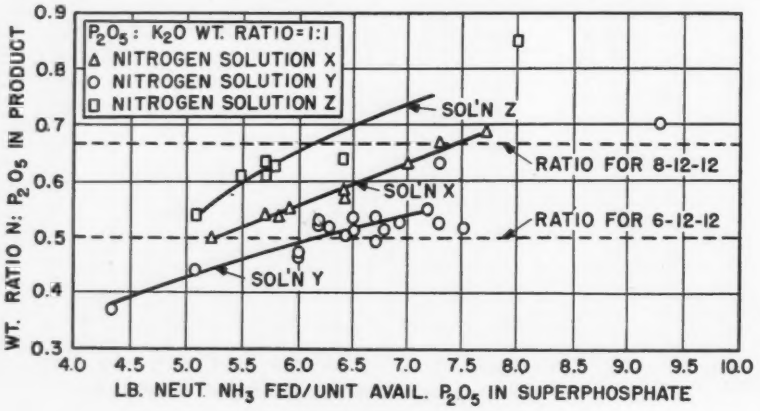


FIGURE 8
EFFECT OF DEGREE OF AMMONIATION ON NITROGEN: P_2O_5 WEIGHT RATIO IN PRODUCT: ORDINARY SUPERPHOSPHATE AND MURIATE OF POTASH

In Figure 8 the N:P_2O_5 weight ratios of the products are plotted against the pounds of neutralizing ammonia fed per unit of available P_2O_5 in the feed when solutions X, Y and Z were used. In order to obtain the 1:2 nitrogen:available P_2O_5 weight ratio for a 6-12-12 (N-P_2O_5-K_2O) product, it was necessary to feed about 6.2 pounds of neutralizing ammonia per unit of available P_2O_5 when solution Y was used and about 5.2 pounds per unit when solution X was used. With either solution and a mixture of ordinary superphosphate and muriate (61 per cent K_2O), the product was more concentrated than 6-12-12, as shown in Table V, and some filler would have to be added to adjust to that grade.

The data indicate that the N: available P_2O_5 weight ratio for an 8-12-12 product could not be obtained using solution X or Y without excessive loss of ammonia because more than 6.5 pounds of neutralizing ammonia would have to be fed per unit of available P_2O_5. They indicate that such a ratio may be obtained using solution Z and feeding about 6.2 pounds of neutralizing ammonia per unit of available P_2O_5. No products were made using this exact degree of ammoniation; however, product 3 in Table V was made using solution Z and feeding 5.7 pounds of neutralizing ammonia.

The immediate loss of availability of P_2O_5 incurred by ammoniation could not be correlated with degree of ammoniation, type of

Table V. Compositions on Pilot-Plant Products Made by Ammoniating A Mixture of Ordinary Superphosphate and Muriate of Potash with Nitrogen Solutions

Product No.	Nitrogen solution	Ratio of plant foods sought	Neutralizing NH_3 fed, lb./unit of avail. P_2O_5 in superphosphate	Composition of product, %				Loss of neutralizing NH_3, %	Immediate loss of P_2O_5 availability, %
				N	Available P_2O_5	K_2O	H_2O		
1	X	6-12-12	5.2	6.7	13.4	(12.8)[a]	5.6	0	2.6
2	Y	6-12-12	6.2	6.6	12.7	13.0	4.3	0	1.6
3	Z	8-12-12	5.7	8.0	12.5	11.3	4.7	2	0.3

[a] Estimated.

nitrogen solution or production rate; however, it seldom exceeded 2 per cent and averaged about 1 per cent.

Figure 9 shows the effect of degree of ammoniation on water solubility of P_2O_5 in mixtures of muriate and ordinary superphosphate. These mixtures were equiponderant with respect to K_2O and P_2O_5 and were ammoniated with nitrogen solution Y. The samples were analyzed a few days after ammoniation. The broken line that follows the indicated reactions shows the variation of water solubility as calculated for the ammoniation of the superphosphate (20.3 per cent A.P.A., 18.6 per cent water-soluble P_2O_5 and 1.0 per cent free acid as P_2O_5). Divergences of the experimental curve from the calculated one may be due to heterogeneity of the samples with respect to degree of ammoniation. The experimental curve is practically the same as that obtained by Kumagai, Rapp and Hardesty (*6*) in tests of the ammoniation of ordinary superphosphate. The data indicate that ammoniation to the degree found to be feasible in the present work reduces water solubility of the P_2O_5 to about 20 per cent.

Granulation

There is considerable interest at present in the granulation of fertilizers. Hardesty and Kumagai (*2*) showed that increasing the particle size of fertilizer decreases its tendency to cake in storage, and Hardesty and Clark (*1*) have stated that granular fertilizers may be distributed uniformly in the field more readily than powdered ones.

The ammoniated products of the tests with mixtures of muriate and ordinary superphosphate mentioned above were not granular probably because the moisture contents and the temperatures of the mixtures during ammoniation were not such as to generate the proportion of liquid phase required for granulation. When six to seven pounds of ammonia were retained per unit of available P_2O_5 in the superphosphate, the moisture content of the product was 4 to 5 per cent and the temperature at which the product was discharged from the ammoniator was 150° to 165° F. Because granulation occurred during ammoniation of concentrated superphosphate in the continuous ammoniator when the water content and temperature were in the right ranges, tests in which both of these factors were varied were made with a mixture of ordinary superphosphate and muriate of potash to produce a granular 6-12-12 (N-P_2O_5-K_2O) product.

Granular products were obtained when hot water was sprayed onto the rolling bed of material being ammoniated. However, the products contained 6 to 9 per cent moisture, and it appeared that drying might be required to prevent them from caking in storage. A granular 6-12-12 product with a moisture content of 4 per cent was made by introducing steam (150 lb./ton of product) under the bed in the ammoniator and adding a small amount of water as spray. The superphosphate that was used in the tests with steam contained only 3 per cent moisture, and about 26 pounds of water per ton of product were added to promote agglomeration. It is believed that with more moist superphosphate no water would have to be added. The addition of steam increased the temperature of the product leaving the ammoniator from about 160° to about 210° F. Loss of neutralizing ammonia and immediate loss of P_2O_5 availability were about the same as those obtained in tests in which no steam or water was added.

It was found that the sphericity and compactness of the granules formed in the ammoniator could be improved by additional rolling. The product from the ammoniator, therefore, was passed through a rotating cylinder (called granulator). This granulator consisted of a horizontal cylinder 24 inches in diameter and 6-½ feet long. A 2-inch retaining ring was located 2

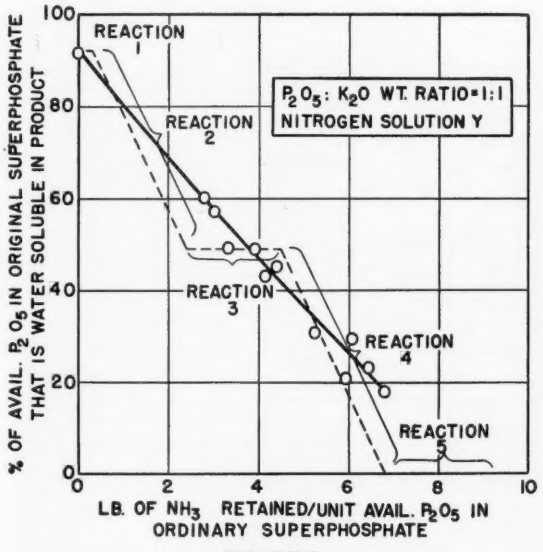
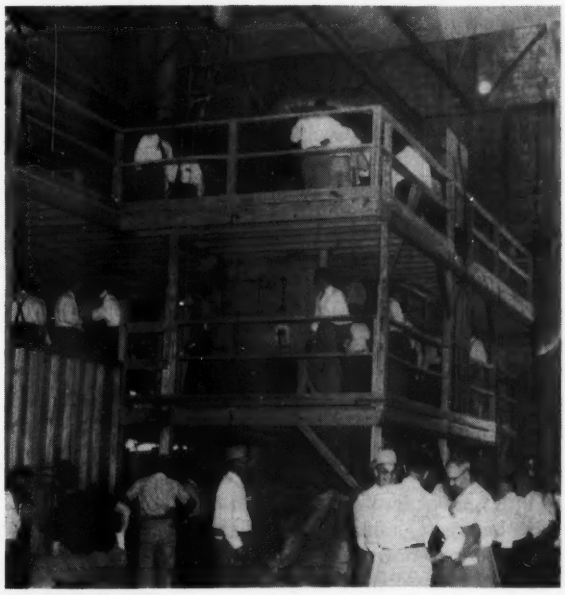


FIGURE 9
EFFECT OF DEGREE OF AMMONIATION ON WATER SOLUBILITY OF P_2O_5: ORDINARY SUPERPHOSPHATE AND MURIATE OF POTASH

Some of the 300 visitors, including industry representatives, who toured TVA's pilot plant last September 13.



feet from the discharge end. Eight ¼-inch rods were welded evenly spaced and longitudinally along the inside of the first 4-½ feet of the granulator to promote rolling of the bed of fertilizer. Without these rods, sliding instead of rolling of the bed occurred. The granulator usually was operated at 20 r.p.m., and the fertilizer was retained within it for about three minutes.

Granular high-nitrogen fertilizers of 10-10-10 and 10-20-20 grades were produced with nitrogen solution as the only source of nitrogen by adding sulfuric acid in the ammoniator. This means of obtaining granulation has been used commercially. The 10-10-10 product was made with ordinary superphosphate, muriate of potash, nitrogen solution X and sulfuric acid. The 10-20-20 product was made with concentrated superphosphate, muriate of potash, nitrogen solution X and sulfuric acid. Chemical and screen analyses and formulations are shown in Table VI. The production rate was one ton per hour. In these tests the neutralizing ammonia in excess of that fixed by ammoniation of the superphosphate was fixed by reacting with the sulfuric acid (93 per cent H_2SO_4), which was introduced under the rolling bed in the ammoniator.

The sulfuric acid distributor, which was fastened to the ammonia distributor and mounted directly behind it, consisted of a 24-inch length of ⅜-inch stainless steel tubing drilled with twenty-nine 1/16-inch holes. At first, acid was sprayed on top of the bed, but it reacted there with potassium chloride and formed hydrochloric acid which was vaporized. The hydrochloric acid reacted while in the vapor state with ammonia and produced a permanent cloud of very fine ammonium chloride crystals which soon filled the space around the ammoniator and was quite obnoxious. During the tests, air was blown onto the bed of material in the ammoniator at the rate of 80 pounds per hour to carry away moisture and to prevent over-agglomeration.

The heat generated in the reaction between sulfuric acid and ammonia promoted granulation at lower moisture contents than would be possible otherwise. The temperature of the 10-10-10 product leaving the ammoniator was about 220° F., or about 50° F. higher than when sulfuric acid was not used with ordinary superphosphate and muriate. The temperature of the 10-20-20 also was about 220° F. In a short test of ammoniating a mixture of concentrated superphosphate and muriate with solution X to the same degree of ammoniation without the addition of sulfuric acid, the temperature of the product was about 165° F., and very little agglomeration occurred.

Figure 10 shows the effect of the proportion of ammonia fed to the system on ammonia losses when producing the 10-10-10 and 10-20-20 fertilizers. The neutralizing ammonia fed, as shown, is the total neutralizing ammonia that was fed minus that required to react with the sulfuric acid. In the mixtures containing ordinary superphosphate, losses of ammonia were higher than they were in tests at the same degree of ammoniation without sulfuric acid (see Figure 6). Immediate loss of P_2O_5 availability was about 1 per cent. Water solubility of the P_2O_5 was practically the same as that in the 6-12-12 fertilizer made at equivalent degrees of ammoniation. In the mixtures that contained concentrated superphosphate, losses of ammonia were somewhat higher than they were in the tests of ammoniation of concentrated superphosphate alone with liquid ammonia at the same degrees of ammoniation and at the same times of retention of the solids in the ammoniator (see Table IV*).

Immediate loss of P_2O_5 availability averaged about 2 per cent, which was lower than that incurred in the ammoniation of concentrated superphosphate with anhydrous ammonia. Water solubility of the P_2O_5 was higher than it was when concentrated superphosphate was ammoniated with anhydrous ammonia (see Figure 2†).

Granular 6-12-12 product that

* *See page 48, July 1954* FARM CHEMICALS

† *See page 47, July 1954* FARM CHEMICALS

Table VI. Formulation, Composition and Screen Analysis for Granular Fertilizers Made Using H_2SO_4 in Ammoniator

Formulation, lb./ton of product

Nominal grade	Nitrogen solution X	Ordinary superphosphate	Concentrated superphosphate	Muriate of potash	93% sulfuric acid
10-10-10	541	1090	-	352	164
10-20-20	507	-	833	655	98.5

Composition, %

Nominal grade	Nitrogen		P_2O_5					
	Total	NH_3	Total	C.I.	Avail.	W.S.	K_2O	H_2O
10-10-10	10.6	7.4	10.9	0.5	10.4	3.1	10.5	2.0
10-20-20	10.0	7.1	20.7	0.8	19.9	-	19.9	2.2

Screen analysis (U.S. series), %

Nominal grade	+4	−4 +6	−6 +35	−35 +50	−50
10-10-10	5.0	6.8	77.2	5.5	5.5
10-20-20	14.3	11.9	64.6	4.1	5.1

contained about 5 per cent moisture was not caked after storage for 12 months in six-ply paper bags having two asphalt-laminated plies. Nongranular 6-12-12 product containing about 4 per cent moisture was caked in six months (6-9% + 2-mesh lumps).

Preliminary results of bag-storage and accelerated caking tests of the 10-20-20 products indicate that those containing more than 3 per cent moisture will cake in storage. Products containing less than about 2 per cent moisture were in satisfactory condition after six months. Tests of storage before and after a short curing period and in bags with only one moistureproof ply are in progress. Results of bag-storage tests of 10-10-10 products are not yet available. However, accelerated caking tests indicate that those containing less than 2 per cent moisture should not cake in storage. The tests also indicated that dusting the 10-10-10 and 10-20-20 products with 2.5 per cent by weight of kaolin or ball clay would reduce their tendencies to cake.

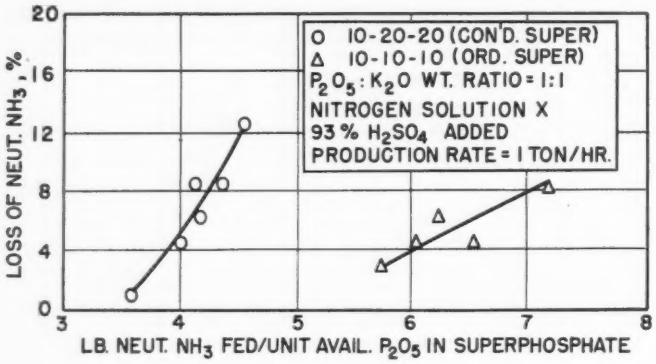


FIGURE 10
EFFECT OF DEGREE OF AMMONIATION ON LOSS OF AMMONIA WHEN PRODUCING 10-10-10 AND 10-20-20 FERTILIZERS

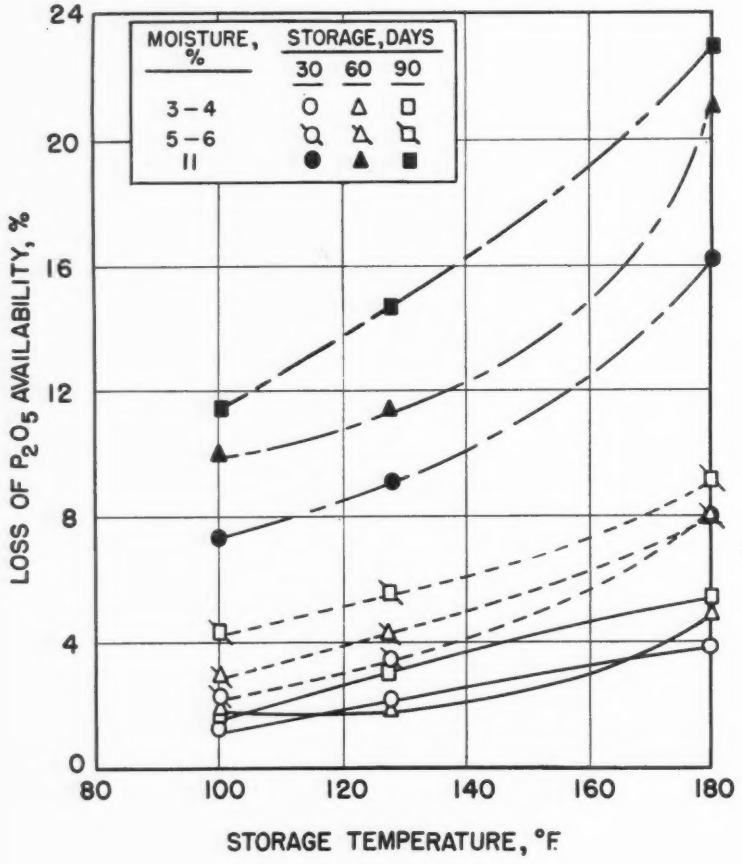


FIGURE 11
EFFECT OF STORAGE TEMPERATURE AND TIME AND MOISTURE CONTENT OF 6-12-12 FERTILIZER ON LOSS OF P_2O_5 AVAILABILITY

Loss of P_2O_5 Availability on Storage

All the losses of P_2O_5 availability that have been mentioned thus far have been those that occurred during ammoniation. Loss of P_2O_5 availability that occurs when ammoniated mixtures are stored hot in piles has been noted by many observers (*3, 4, 5, 8*); therefore, it appeared desirable to obtain an indication of the magnitude of these losses in hot piles of some of the highly ammoniated materials that were produced in the present work. It appeared desirable also to determine the effects of the pertinent variables, that is, moisture content of the fertilizer and time and temperature in storage since these variables have been shown to have significant effects (*3, 4, 5, 8*). The magnitude of the effect of temperature determines the need for cooling, and the magnitude of the effect of moisture determines the need for drying or changing formulation.

It was impossible in the pilot plant to produce piles of fertilizer large enough to hold their temperature for long periods; consequently, laboratory tests were made in which the conditions of pile storage were simulated. Samples of ammoniated fertilizer were sealed in glass jars and held in an oven for various periods at 100°, 130°, and 180° F. In several series of tests, 6-12-12 fertilizers in which six to seven pounds of neutralizing ammonia had been retained per unit of available P_2O_5 in the original ordinary superphosphate were used. In

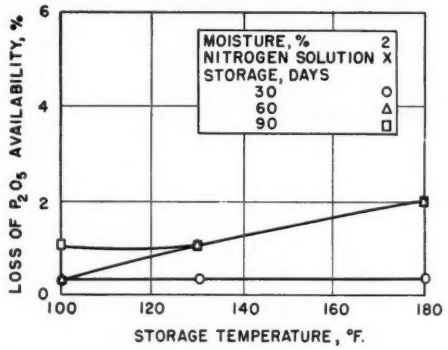


FIGURE 12
EFFECT OF STORAGE TEMPERATURE AND TIME ON LOSS OF P_2O_5 AVAILABILITY IN 10-10-10 FERTILIZERS CONTAINING ORDINARY SUPERPHOSPHATE

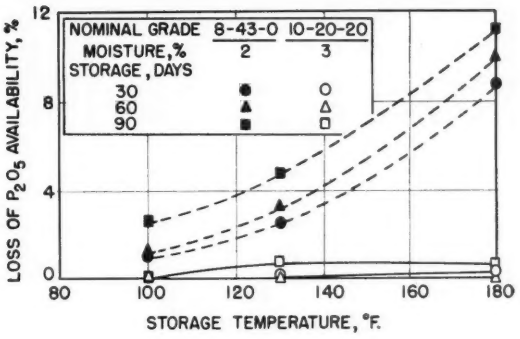


FIGURE 13
EFFECT OF STORAGE TEMPERATURE AND TIME ON LOSS OF P_2O_5 AVAILABILITY IN FERTILIZERS CONTAINING CONCENTRATED SUPERPHOSPHATE

making some of the samples for the oven tests, the moisture content was increased by spraying water on the bed in the ammoniator. Samples with 3 to 4, 5 to 6, and 11 per cent moisture were tested.

The results of these tests are shown graphically in Figure 11. The data indicate that loss of P_2O_5 availability increased with time, temperature, and moisture content, which would be expected from the results of work by others as mentioned. The data also indicate that the loss of availability in the highly ammoniated fertilizers of the present work will be as low as 2 per cent only if the moisture content is below 4 per cent and the storage temperature is below 120° F.

Figure 12 shows loss of P_2O_5 availability in storage of the 10-10-10 fertilizer as determined by means of oven tests. The moisture content of the samples was 2 per cent. The losses are much less than those in the 6-12-12 fertilizer of slightly higher moisture content, which may indicate a beneficial effect of the presence of a large amount of ammonium sulfate. The ammonium sulfate had been formed through the reaction of ammonia and sulfuric acid in the ammoniator. Keenen (*1*) showed that the presence of ammonium sulfate decreased the loss of P_2O_5 availability that occurs during ammoniation and storage of ordinary superphosphate.

Figure 13 shows the losses of P_2O_5 availability in the storage of concentrated superphosphate that had been ammoniated with liquid anhydrous ammonia (8-43-0) and in the 10-20-20 fertilizer, which contained concentrated superphosphate as its only phosphatic constituent. Moisture contents of the 8-43-0 and 10-20-20 fertilizers were 2 and 3 per cent, respectively. Losses with 10-20-20 were much lower than they were with 8-43-0. The 10-20-20 contained a large proportion of ammonium sulfate which had been formed in the ammoniator through the reaction of ammonia and sulfuric acid.

Summary

A continuous ammoniator of simple design was developed on a pilot-plant scale. Tests indicated that this type of equipment would be practical for the ammoniation of superphosphate and fertilizer mixtures in fertilizer plants. The underlying principle upon which the ammoniator works is the introduction of the ammoniating medium, which may be a nitrogen solution or gaseous or liquid ammonia, under a bed of fertilizer that is being rolled in a cylinder. The design that has been evolved appears effective, but optima for such design variables as bed depth and ratio of length to diameter of the cylinder have not been determined.

The ammoniator appears to be adaptable to use in a continuous process for the production of granular fertilizer. The rolling bed within it promotes granulation when the proportions of liquid and solid phases in the fertilizer are in the proper range. Air may be blown onto the bed in the ammoniator to remove moisture from the surface of the particles and from the atmosphere above the bed thereby preventing excessive agglomeration in some mixtures that tend to become very wet during ammoniation.

Tests of the ammoniation of mixtures in the present pilot-plant ammoniator are continuing. Most of these tests involve simultaneous ammoniation and agglomeration. Several commercial-scale continuous ammoniators of the type described here have been built and where results are known to the writers are performing satisfactorily. ◆

Acknowledgment

The authors wish to acknowledge the contributions of Z. A. Stanfield, F. P. Achorn, D. W. Rindt and R. S. Meline who participated in the work in its early phases and of J. E. Jordan who has been active recently in design and operation of equipment. They are indebted also to T. P. Hignett and J. Silverberg whose comments made throughout the study served to help direct the course of the work. A significant portion of the analytical work was done by D. R. Miller and L. J. Sheffield.

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Storage of Herbicides

Help Your Customers Get Top Value from Weed Killer Use Through Proper Storage

By J. A. Kelly and L. L. Coulter
Dow Chemical Co.

TODAY the agriculturalist has available many herbicides that are helpful in solving his weed killing problems. However, many of these chemicals are new to the trade and while considerable information has been released relative to methods of use, very little information is available on their handling and storage.

This is an important consideration in the successful use of herbicide formulations by the consumer. To fully understand the important factors in storage it is first necessary to consider what a herbicide formulation is.

A formulation is a means of putting an herbicide in such a form that it can be applied with equipment available to the consumer. Many different herbicide formulations are available on the market. These include wettable powders, water soluble solids, water miscible liquids, emulsifiable oil concentrates and oil concentrates.

Herbicide Formulations

A formulation is necessary to facilitate use of most herbicides because of the physical nature of the toxicant chemical. Some chemicals are water-insoluble, some are oil-insoluble, others are solid lumps. Frequently in their original form they are practically useless to the consumer. For example, a chemical modified or formulated so it can be used in a water solution simplifies its application when dosages as low as four ounces per acre are involved, for it is nearly impossible to distribute four ounces of a solid over an acre in a uniform manner.

Because herbicides of the plant growth regulator type are effective in such small amounts per acre, proper formulations are essential to their most effective use. Several types of formulations are represented in the many herbicides available today. These may be briefly described as follows:

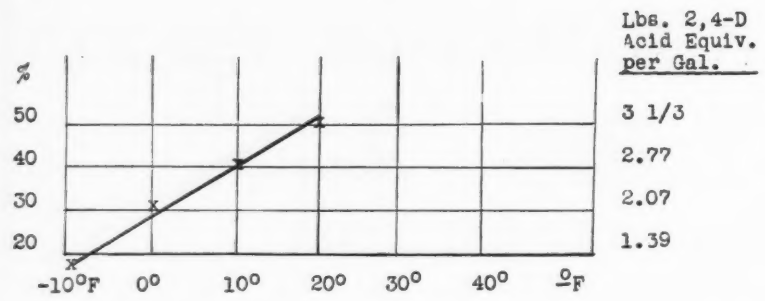
A wettable powder is the formulation generally used with herbicidal chemicals that are insoluble in water or oil, or are difficultly soluble in these solvents.

A fine dispersion of the herbicide can be obtained with a wettable powder consisting of a diluent such as a diatomaceous earth or a clay

FIGURE 1. HERBICIDE FORMULATIONS CURRENTLY AVAILABLE

TOXICANT	Water Soluble Solids, Alkali Salts	Walter Soluble Alkanol & Alkyl Amine Salts	Emulsifiable Oil Concentrates	Oil Concentrates	Wettable Powders	Dusts
2,4-dichlorophenoxy acetic acid (2,4-D)	X	X	X	X	O	X
2,4,5-trichlorophenoxyacetic acid (2,4,5-T)	O	X	X	X	O	O
4-chloro-o-toloxyacetic acid (MCP)	X	X	O	O	O	O
2-(2,4,5-trichlorophenoxy) proprionic acid (Silvex)	O	O	X	O	O	O
Trichloroacetic acid (TCA)	X	O	O	O	O	O
2,2-dichloropropionic acid (Dalapon)	X	O	O	O	O	O
4,6-dinitro-2-sec.-butyl phenol (DNOSBP)	X	X	X	X	O	O
Sulfamic acid (Ammate)	X	O	O	O	O	O
3-(p.chlorophenyl)-1,1-dimethyl urea (CMU)	O	O	O	O	X	O
Isopropyl m-chlorocarbanilate (Chloro IPC)	O	O	X	X	O	O
Sodium 2,4-dichlorophenoxy ethyl sulfate (S.E.S.)	X	O	O	O	O	O
Pentachlorophenol (PCP)	X	O	X	X	O	O
Sodium Chlorate	X	O	O	O	O	O
Sodium Borates	X	O	O	O	X	O

Figure 2.



carrying the finely divided toxicant. Suitable wetting and dispersing agents are included in the formulation.

The entire formulation is so finely ground that approximately 95 per cent will pass a 325 mesh screen. In use wettable powders are simply added to the dilution water and are kept dispersed in the spray tank by agitation during application.

Water Soluble Types

Water soluble solids are materials that are easily dissolved in water by the user and are of such physical form that they can be conveniently handled and shipped as solids. Occasionally such herbicides may be formulated to contain a wetting agent to modify the wettability of the spray solution. Once dissolved in the spray solution, no further agitation is needed with water soluble solids.

Water soluble liquid formulations are used with herbicidal chemicals that are readily water soluble but are of such physical form that they cannot be conveniently handled as undiluted chemicals. For example, an alkanol amine salt formulation of 2,4-D containing four pounds 2,4-D acid equivalent per gallon is a free-flowing liquid that is easily diluted with water in the spray tank and can be conveniently measured. This formulation can also be stored over a wide range of temperature without freezing or segregating. It does not deteriorate in storage.

However, the actual toxicant, alkanol amine salt of 2,4-D is a heavy, viscous liquid at room temperature that would be very difficult for the user to measure or mix in water. Also at lower temperatures it becomes so stiff it resembles taffy. It is, therefore formulated in such a manner that it has the free flowing stable properties associated with 2,4-D amine salt formulations. Water soluble formulations need no agitation once a complete solution is obtained.

Emulsifiable oil concentrates are formed with herbicidal chemicals that are very soluble in certain aromatic oils or solvents but insoluble in water. An emulsifier is added to such oil solutions in sufficient amount to cause these oil solutions to be finely dispersed in water when added to the spray tank.

The combination of herbicidal chemical plus solvent and emulsifier constitutes an emulsifiable oil concentrate. Such formulations are designed to emulsify easily in all kinds of dilution water (hard or soft). Once dispersed, moderate agitation is required to keep the emulsion from settling out of suspension. By-pass agitation is sufficient for this purpose.

Oil concentrates are similar to the emulsifiable oil concentrates but do not contain an emulsifier and hence will not mix with water. Such products are used where the spray diluent is fuel oil or kerosene or where the concentrate is applied directly without further dilution.

Figure 1 illustrates some of the principal herbicide formulations available for use at this time.

Herbicide Storage

From Figure 1 it is evident that the proper storage of herbicides is a complex subject. For reasons of clarity, then, we will discuss storage problems in terms of solid formulations and liquid formulations.

Solids

Those herbicides available as solids of one sort or another include (1) water soluble solids, such as alkali salts, (2) wettable powders and (3) dusts.

Herbicidal dusts are generally the easiest chemicals to store. In the case of 2,4-D dusts, for example, all that is required is a clean dry area so that the packages will not suffer deterioration. Low winter temperatures are not a problem and such dusts also stand up well in storage at high summer temperatures.

Herbicidal wettable powders may be stored much the same as dusts. With either type of formulation direct wetting of the packages should be avoided or caking and loss of flowability of the product can occur.

Water soluble solids present a different storage problem. These materials packaged as solids that are dissolved in water for use need extra care in storage. The very fact that they are water soluble means that they must be kept dry. If exposed to moist, humid atmospheres such solids can cake sufficiently to make subsequent use very difficult.

In addition, many water soluble solids such as Sodium TCA are hygroscopic; that is, they have the ability to take moisture out of the air. In humid storage areas it is possible for exposed Sodium TCA to actually dissolve itself in the moisture that it removes from the atmosphere. Thus, it is important for the user to observe the label directions and carefully close such packages after use. With materials of this nature the manufacturer supplies packages that are moisture-proof to prevent such an occurrence from happening. The user should provide a clean dry place to store such chemicals, and he should be sure that all packages are tightly closed after use. A storage area for chemicals of this nature should be protected from great changes in temperature to assist in preventing caking of the product. Extremely high temperatures should be avoided (over 125° F). Chemicals that fall in this category include:

Sodium TCA, Dalapon, Sodium Salt, Sodium Pentachlorophenate, Chlorates, Borates and Ammonium Sulfamate.

Liquids

Liquid herbicide formulations present more problems in storage and these problems vary from one type of formulation to another.

Some general recommendations applicable to all liquid formulations can be made, however:

1. Store in a clean, dry area.
2. Protect liquid formulations from extremes of temperatures.
3. Protect cans from water. Store on pallets or duckboards to avoid rust of the outside bottoms of containers.
4. Keep containers tightly closed except when removing contents.
5. Avoid getting *any* water in the container. With many chemicals small traces of water can initiate deterioration of the chemical, the container, or both.
6. When air-vents are punched in the tops of cans to facilitate pouring, such holes should be plugged or sealed after use to prevent the entry of dirt and moisture.
7. Store in an area where accidental escape from the cans will not cause contamination of seeds, insecticides, fertilizers and other agricultural products.

Item 2 is of special interest. A liquid formulation is a *solution* of a chemical in a *solvent.* Solvency of a chemical depends on temperature and is usually reduced when the temperature falls.

Solvency

Thus we find, for example, that a formulation containing 3⅓ pounds per gallon of 2,4-D acid as the isopropyl ester is soluble at 40° F but begins to show crystals of the isopropyl ester of 2,4-D appearing when the temperature reaches about 20° F.

This continues until at 0° F about one third of the active material has settled to the bottom of the container in the form of crystals of the ester as it is no longer as soluble at 0° F as it was at 40° F.

Figure 2 will further illustrate this. Here we have dissolved 50 per cent by weight of isopropyl ester of 2,4-D (3⅓ pounds, 2,4-D acid equivalent per gallon) in a typical solvent used in quality formulations and we have determined how much of this ester is soluble at various temperatures in this solvent.

As is apparent from Figure 2, the formulation is a true solution at temperatures above 20° F. Below this point the ester begins to crystallize out—the colder it gets the more it settles out.

This happens with other herbicides in other solvents in a similar manner. Thus it is recommended that practically all liquid formulations of herbicides be protected against storage at temperatures much below freezing (32° F). If this cannot be done the containers should be brought to a warm place before use and allowed to warm up to about 40° F. The containers should then be rolled or agitated until all material has been redissolved.

High temperatures; i.e., about 95° F., should be guarded against in storage places. Prolonged storage at high temperatures may cause the chemical to deteriorate. This in turn may cause the emulsifier to fail to perform efficiently, so that the chemical does not mix properly and field performance may be spotty. Furthermore, high temperatures can accelerate package corrosion by certain chemicals.

Finally, high temperatures can cause expansion of the liquid con-

FIGURE 3.—SAFE STORAGE TEMPERATURES FOR SOME LIQUID HERBICIDES

Herbicide and Formulations	Typical Minimum Safe Extended Storage Temperature in Degrees F
2,4-D	
isopropyl ester 3⅓ lbs/gal acid equiv.	**32° F**
butyl ester 4 lbs/gal. acid equiv.	**20° F**
polypropylene glycol butyl ether ester 4 lbs/gal. acid equiv.	**0° (does not freeze or segregate)**
alkanol amine salt 4 lbs/gal acid equiv.	**15° F**
dimethylamine salt 4 lbs/gal acid equiv.	**20° F**
2,4,5-T	
polypropyleneglycol butyl ether ester containing 4 lbs 2,4,5-T acid/gal.	**0° F**
mixed butyl ester containing 4 lbs 2,4,5-T/gal.	**20° F**
triethylamine salt 4 lbs 2,4,5-T acid/gal	**15° F**
Brush Killer	
50-50 mixture of 2,4-D and 2,4,5-T polypropylene glycol butyl ether esters 4 lbs total acid equiv./gal.	**0° (does not freeze or segregate)**
DNOSBP	
emulsifiable oil concentrate containing 5 lbs. DNOSBP/gal. (general type weed killer)	**20° F**
alkanol amine salt formulation containing 3 lbs. DNOSBP/gal. (premerge-type)	**0° F**
Selective-type weed killer	**32° F**
MCP amine weed killer	**15° F**

tents of a package. Such expansion is sometimes sufficient to cause the heads of drums to bulge by development of hydrostatic pressure.

If a drum is bulged in this manner, cools, and then is exposed to high temperatures again and this cycle is repeated several times it is possible for the flexing of the drum to cause leaks to develop at the seams. The resultant leak can cause loss of material and contamination of companion stored products.

All containers should be tightly closed with no holes left open. Keep water and moisture out of the containers. Not only can a small amount of moisture cause some toxicant chemicals to deteriorate, but it can also cause formation of a jelly-like material in some emulsifiable oil concentrates. This reduces the efficiency of the emulsifier and can affect the use of the product. Emulsifiable formulation such as 2,4-D esters sometimes discolor and take on an appearance similar to chocolate milk. This may occur when water is allowed to enter the containers. If this action has not been severe the material may still be effective although the emulsifying properties of the formulation may be reduced.

Figure 3 summarizes the safe storage temperatures for some common liquid herbicides.

It may easily be seen that considerable research effort is involved in developing satisfactory herbicide formulations for commercial use. The nature of the herbicide does not always lend itself to the most desirable type of formulation. However, in most instances, those now available to the consumer represent the best effort of the manufacturer.

It is important for the user to carefully review the label for use and handling recommendations before undertaking field work or storing these materials. ◆

Sulfur Consumption Down in 1952

A report by the Chemical and Rubber Div., Business and Defense Services Administration, shows that 1952 consumption of elemental sulfur for all purposes decreased about 5 per cent below the 1951 level while usage, exclusive of exports, dropped about 7 per cent during the same period.

Chemical production was the major use for this raw material representing over four fifths of the total domestic consumption in each of the years 1950–52. The report points out that because of the sulfur conservation methods by producers of sulfuric acid by late 1950, the 2 per cent rise in acid production from 1950 to 1951 is not reflected by increased sulfur usage. A similar situation existed in 1952.

The sulfur goal which includes elementary sulfur was originally set at 8,400,000 long tons to be reached by the first of 1955. This goal was then extended to Jan. 1, 1956 and revised to 7,700,000 tons, some 1,600,000 tons greater than the 1950 production of both elemental sulfur and sulfur equivalents.

The report, the fourth of a series of individual chemical analyses to be made available by the BDSA, points out that 1950–52 consumption was affected considerably by sulfur limitation and conservation measures brought on by the Korean conflict. ◆

Elemental Sulfur, 1950-52

(Thousands of Long Tons)

END OF YEAR STOCKS	1950	1951	1952
Total stocks[1]	—[2]	3,341	3,665
Producers' Frasch stocks	2,655	2,837	3,069
Producers' recovered sulfur stocks	—[2]	80[3]	95
Consumer stocks	488[4]	424	501
SUPPLY			
	1950	1951	1952
Supply-Total	5,335	5,466	5,551
Native sulfur production[5]	5,193	5,280	5,295
From Frasch mines	5,192	5,278	5,293
From other mines	1	2	2
Recovered sulfur[5]	142	184	251
As brimstone	139	182	249
As paste	3	2	2
Imports[6]	—	2	5
ESTIMATED CONSUMPTION[7]			
	1950	1951	1952
Use—Total	5,577	5,395	5,143
Domestic use—total (excl. exports)	4,136	4,112	3,839
Chemicals	3,354	3,391	3,203
Sulfuric acid	3,077	3,074	2,925
Carbon bisulfide (CS_2)	183	214	186
Other chemicals	94	103	92
Pulp and paper	418	391	371
Ground crude and refined for agricultural uses[8]	274	248	198
Rubber	46	42	39
Exports (crude sulfur only)[6]	1,441	1,283	1,304
Miscellaneous	44	40	28

[1] Producers' stocks are from the Bureau of Mines, U. S. Department of Interior. Consumer stocks were derived from reports to the NPA on forms NPAF-98, 157 and 158. [2] Not available. [3] Data as of January 31, 1952. [4] Data as of May 31, 1951.
[5] Data are from the annual "Mineral Market Report" of the Bureau of Mines.
[6] As reported by the Bureau of the Census, U. S. Department of Commerce. 1950 imports amounted to less than 30 long tons.
[7] Based on consumers' reports on forms NPAF-98, 157, 158. Consumers of less than 20 short tons per month were not required to report. It is estimated, however, that more than 98 per cent of consumption has been herein covered.
[8] Excludes industrial uses but includes exports of ground crude and refined.

Safety Facts and Figures

By W. C. Creel
Safety Director
North Carolina Dept. of Labor

MOST fertilizer plants do not have safety programs. Even more disconcerting is the fact that a majority of the plants which claim to have safety programs do not have very effective ones.

Too many so-called safety programs are not real or effective, nor have they ever been. Many are set up because of directives from a main office hundreds of miles away. Other plants claiming to have safety programs do so because a safety engineer visits the plant once a year.

Basic Essentials

To have an effective safety program, a plant must at least have these basic essentials to carry out accident prevention work: a safety committee, plant inspection, a program of machine guarding, a system of good housekeeping and a first-aid setup.

Because most fertilizer plants fail to have these basic necessities, I think you can say it is a fact that one of the needs of the industry is effective safety programs in every plant!

Many of the plants which have safety committees—so important to any safety program—fail to get results from this simple form of safety organization. It has been said that a committee is a group which keeps minutes and wastes hours. Most safety committees in fertilizer plants are not organized well enough to even keep minutes. If business meetings in the plants were conducted in the same manner as many of the safety meetings, the fertilizer plants would cease operation in a short time.

Not too long ago I was visiting a fertilizer plant and was told that the regular monthly safety meeting was to be held that afternoon and that the officials would be delighted to have me sit-in. At the appointed time I was present for this meeting and noticed that everyone present was a superintendent or a key foreman, with the exception of me and one employee.

For fifty-five minutes production and almost every phase of the plant program, with the exception of safety, was discussed. Finally, the presiding superintendent pulled out his watch and said: "We have a few minutes left. Does anyone have any safety problems?" No one did.

I will agree that production and safety are closely allied, but when you combine the two into a single meeting, safety suffers. Most so-called safety committees have little or no organization and seldom meet, and when they do they discuss everything but safety. Little is accomplished because of the lack of effective planning by the person responsible for safety. Safety meetings should be planned and conducted on a business-like basis, just like any other part of a business organization.

From a talk presented before the Fertilizer section of the Southern Safety Conference, Louisville, Ky., on March 8, 1954.

Workers Must Participate

Another reason for the ineffectiveness of safety organizations is the lack of employee participation. Far too often, the production worker is overlooked in planning a safety program. To be successful in accident prevention work, one cannot forget that a safety program is for the man on the job and must be geared to his needs. If you are to carry your safety program to the workers, they must have recognition, representation on safety committees and they must be given certain genuine authority to carry out basic safety duties.

The developing of a safety program is gradual and so is the decline and there lies the ever present dangers of complacency and indifference. Because development is gradual, many companies and individuals start out with a flurry, but some lose interest when the results are not instantaneous.

Conversely there is a danger of gradual decline. Complacency on the part of those in charge causes many programs to lose their effec-

tiveness in such a gradual manner that nothing is done until too late.

I know of a plant which had an excellent safety program during World War II, but gradually it declined to the point where it was no longer effective. Looking back it was easy to see that one of the signs of this decline was an increasing accident frequency rate. Rather than face the facts, those in charge of safety in this plant explained away the increase by saying that their plant rate was still lower than the state or national average. Another indication and cause of the decline was the assumption of too many other duties by the safety director.

One of our industrial safety inspectors who called on this plant was told that the plant safety director couldn't accompany him on his plant inspection because it was his day to collect money from the Coca Cola machines. A third sign of an ineffective safety program at this particular plant, which was not recognized until late but caused action when it was apparent, was an increase in accident costs and absenteeism.

Acknowledge the Problem

It is better to acknowledge an accident problem than to hide it. Have you ever heard of safety directors who had injured workers coming to work on crutches to protect their frequency rate? Then there are those who get all kinds of rulings to keep from having lost time injuries charged to them. We all realize that practices of this kind are detrimental to a progressive program.

In the particular plant which I mentioned above, once the need was realized, a plan of organization was developed to re-activate the program. Plant management decided to give first-aid training to key supervisors and workers in each of the small divisions of the plant. Those taking the course not only became well trained in first-aid, but became accident conscious and served as a nucleus for re-activating the entire accident prevention program.

The second fact concerning fertilizer safety deals with the dangers of accepting and using over-simplifications. How many of you have heard, or said, "85 per cent of industrial injuries are caused by unsafe acts?" Unsafe acts is the term used by the safety engineer. Plant management usually uses the word carelessness.

Unsafe Acts

Whether you say acts or carelessness, by saying "85 per cent of industrial injuries are caused by unsafe acts or carelessness" and doing nothing about it, you are using the No. 1 alibi and the all American safety out.

Forrest H. Shuford, Commissioner of Labor for North Carolina, in a recent safety speech said: "Over a period of years the belief has been growing that most accidents are being caused by unsafe acts rather than unsafe conditions. You have probably heard quoted from time to time that 75 or even 85—and I have heard as high as 90—per cent of all accidents are caused by unsafe acts. In a sense this might be true, but actually the majority of accidents are caused by a combination of unsafe acts and unsafe conditions.

"It is a combination of the two that tends to cause the accidents. When we neglect one for the other we are omitting an essential part of an accident prevention program. In my opinion, the pendulum has swung too far. It's time to get back to the basic fact that good machine guarding and good working conditions are the most important parts of an accident prevention program."

Foreman's Place

The third fact concerning fertilizer safety deals with the place of the foreman, and at this time I would like to take the opportunity to quote an excellent, but brief, article by Vernon Gornto, who is in charge of safety work of Smith-Douglass, Inc.:

"The safety engineer may be on the job from morning to night—and even later; the company may provide the most modern industrial plant with equipment well guarded by safety devices; bulletins and articles in the company magazine may feature ways and means of preventing accidents constantly—but, the real job of making the worker safety-conscious still belongs to the foreman.

"The foreman is the key man in the whole program of accident prevention because he is the one man who is responsible for seeing that the rules of safety actually are followed in his department. In addition, it is he who, by his example, encourages the habit of thinking and practicing safety."

What is wrong with this? I would say only one thing. It is not generally true. The foreman could be, and should be, the key man in a safety program, but unfortunately he usually is not. The average foreman does not believe in safety enough to be a leader, not to mention a key man. I am speaking of a foreman in the sense of supervising employees between top management and production worker.

Often the 'Bottleneck'

Instead of being a medium of transmitting the program from management to worker, the foreman is too often the bottleneck that stops the program. Last summer our department was holding a Regional Fertilizer Safety Meeting, and all plants in the area had indicated that they would be represented. On the day of the meeting the office manager of one company called and said: "I am so sorry our foreman cannot attend, but it was so dusty in our plant this morning that he didn't see a payloader and was run over. He won't be out of the hospital in time for the safety meeting."

Who postpones the safety meeting because of production problems?

Who, instead of going himself, sends the master mechanic or office clerk, with the safety engineer on plant inspections?

Who says that he cannot have a good safety program because of the type worker he has to hire?

The answer to all three of these questions is the foreman. The same man who is supposed to be the key man in a safety organization.

As the Christophers say: "It is better to light just one candle than to curse the darkness."

Leadership in the fertilizer safety movement is needed and needed badly.

It won't come from management, although this group has a stake and will do its part if properly shown the facts.

1953 Super Production Down

Final figures from the Bureau of the Census show that total superphosphate production decreased slightly during 1953 as compared to 1952, reflecting lower production of normal and enriched and wet base goods. A total of 211 normal superphosphate plants were reported, a gain of four over 1952. Seven wet base units, the same as recorded in 1952, were included.

Production of concentrated materials increased in 1953 as seven new units came into production to make a total of 21 plants

Changes in the recording system were made by the bureau in July 1953 as provision was made for reporting data separately for enriched superphosphate and as all quantities were changed to equivalent short tons of 100 per cent APA.

Statistics refer only to superphosphate as such and includes no data for super in dry-base or dry-mixed goods. Figures for receipts of materials, shipments, consumption and stocks relate only to producing plants. ◆

Table 1.—SUPERPHOSPHATE: PRODUCTION, DISPOSITION, AND STOCKS, CLASSIFIED BY TYPE, IN THE UNITED STATES, 1953

(In short tons of 100% A.P.A.)

Product and item	Total	January	February	March	April	May	June	July	August	September	October	November	December
TOTAL													
SUPPLY, TOTAL	...	459,193	469,747	472,865	438,393	374,614	360,898	383,062	408,785	422,461	432,824	421,622	451,916
Stocks on hand, beginning of month	...	[1]278,144	287,535	265,834	215,127	171,206	190,574	224,185	241,028	253,737	257,903	257,069	274,533
Production	2,147,462	179,747	179,125	204,373	219,896	201,072	168,664	155,831	165,429	164,870	172,830	161,878	173,747
Receipts at plant	27,201	1,517	1,158	2,112	3,897	2,163	1,582	1,893	2,489	2,491	2,898	1,978	3,023
Book adjustments (account of inventory)	+4,842	-215	+1,929	+546	-527	+173	+78	+1,153	-161	+1,363	-807	+697	+613
DISPOSITION, TOTAL	2,166,855	171,658	203,913	257,738	267,187	184,040	136,713	142,034	155,048	164,558	175,755	147,089	161,122
Shipments	1,292,089	106,883	124,992	148,861	148,637	101,313	86,727	85,211	91,924	97,392	104,707	95,694	99,748
Used in reporting plants	874,766	64,775	78,921	108,877	118,550	82,727	49,986	56,823	63,124	67,166	71,048	51,395	61,374
Stocks on hand, end of month	...	287,535	265,834	215,127	171,206	190,574	224,185	241,028	253,737	257,903	257,069	274,533	290,794
NORMAL AND ENRICHED SUPERPHOSPHATE													
SUPPLY, TOTAL	...	377,990	391,894	395,731	367,708	306,481	286,804	300,117	324,547	338,582	348,170	335,246	362,240
Stocks on hand, beginning of month	...	[1]235,950	246,486	227,485	182,588	144,278	156,017	185,326	199,506	208,533	213,691	208,447	221,012
Production	1,678,459	141,130	142,289	165,752	181,183	158,491	129,713	112,682	122,513	126,886	134,259	125,116	138,445
Receipts at plant	19,303	1,135	1,158	1,942	3,602	1,795	886	1,290	1,970	1,710	1,170	1,351	1,285
Book adjustments (account of inventory)	+6,429	-225	+1,961	+552	+335	-83	+188	+819	+550	+1,453	-899	+332	+1,498
DISPOSITION, TOTAL	1,703,828	131,504	164,409	213,143	223,430	148,464	101,478	100,611	116,014	124,891	139,723	114,234	125,927
Shipments	850,970	67,969	86,722	106,713	107,432	67,168	51,921	45,523	55,129	60,316	70,756	64,558	66,763
Used in reporting plants	852,858	63,535	77,687	106,430	115,998	[illegible]	49,557	55,088	60,885	64,575	68,967	49,676	59,164
Stocks on hand, end of month	...	246,486	227,485	182,588	144,278	156,017	185,326	199,506	208,533	213,691	208,447	221,012	236,313
CONCENTRATED SUPERPHOSPHATE													
SUPPLY, TOTAL	...	76,294	72,257	71,323	66,688	68,546	72,511	81,894	82,770	81,089	81,397	82,259	86,341
Stocks on hand, beginning of month	...	39,200	36,568	33,699	29,411	25,881	33,687	37,760	40,656	43,891	41,825	45,969	49,870
Production	457,235	37,039	35,691	37,474	37,180	42,042	38,187	42,928	42,149	36,519	37,503	35,713	34,814
Receipts at plant	7,898	382	...	170	295	[illegible]	696	603	519	781	1,719	627	1,738
Book adjustments (account of inventory)	-221	-323	-2	-20	-198	+255	-59	+603	-534	-102	+310	-50	-81
DISPOSITION, TOTAL	452,808	39,726	38,558	41,912	40,807	34,859	34,751	41,238	38,879	39,264	35,388	32,389	35,037
Shipments	433,097	38,642	37,479	40,050	38,871	33,578	34,359	39,523	36,660	36,726	33,538	30,784	32,887
Used in reporting plants	19,711	1,084	1,079	1,862	1,936	1,281	392	1,715	2,219	2,538	1,850	1,605	[illegible]
Stocks on hand, end of month	...	36,568	33,699	29,411	25,881	33,687	37,760	40,656	43,891	41,825	45,969	49,870	[illegible]
WET-BASE GOODS													
SUPPLY, TOTAL	...	4,909	5,596	5,811	3,997	1,587	1,583	1,051	1,468	2,790	3,297	4,117	3,335
Stocks on hand, beginning of month	...	2,994	4,481	4,650	3,128	1,047	870	1,099	866	1,313	2,387	[illegible]	3,651
Production	11,768	1,582	1,145	1,147	1,533	539	764	221	767	1,465	1,068	[illegible]	488
Receipts at plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Book adjustments (account of inventory)	-1,366	+333	-30	+14	-644	+1	-51	-269	-165	+12	-158	+415	-804
DISPOSITION, TOTAL	10,219	428	946	2,683	2,950	717	484	185	155	403	644	[illegible]	158
Shipments	8,022	272	791	2,098	2,334	567	447	165	135	350	413	352	98
Used in reporting plants	2,197	156	155	585	616	150	37	20	20	53	231	114	60
Stocks on hand, end of month	...	4,481	4,650	3,128	1,047	870	1,099	866	1,313	2,387	2,653	3,651	3,177

[1]Stocks on hand as of January 1, 1953 differ from the quantities held on December 31, 1952 because the 1953 statistics include reports for 3 plants for which no 1952 information was received

Table 3.—SUPERPHOSPHATE: PRODUCTION, DISPOSITION, AND STOCKS, BY YEARS, 1943-1953

(In short tons of 100% A.P.A.)

Product and year	Supply					Disposition			
	Number of plants[1]	Stocks on hand, beginning of year	Production	Receipts at plant	Book adjustments	Total shipped or consumed by producing plants	Shipments	Used in producing plants	Stocks on hand, end of year
Normal and enriched									
1953	211	[2]235,950	1,678,459	19,303	+6,429	1,703,828	850,970	852,858	236,313
1952	207	196,349	1,765,000	31,711	+8,434	1,771,766	874,846	896,920	[2]229,728
1951	208	190,122	1,708,825	25,510	+3,535	1,731,643	883,849	847,794	196,349
1950	200	[2]209,451	1,673,289	19,315	+14,541	1,726,474	911,718	814,756	190,122
1949	183	219,022	1,633,663	16,984	+5,512	1,670,094	872,132	797,962	[2]205,087
1948	179	154,149	1,677,545	22,167	+7,925	1,642,764	862,140	780,624	219,022
1947	165	116,330	1,672,682	20,264	+10,806	1,665,933	855,418	810,515	154,149
1946	161	145,445	1,412,566	19,718	+11,986	1,473,385	795,901	677,484	116,330
1945	159	143,060	1,326,979	23,696	+804	1,349,094	779,938	569,156	145,445
1944	157	142,256	1,204,626	15,668	+1,237	1,220,727	711,252	509,475	143,060
1943	153	181,465	1,133,040	14,746	+2,453	1,189,448	708,353	481,095	142,256
Concentrated									
1953	21	39,200	457,235	7,898	-221	452,808	433,097	19,711	51,304
1952	13	29,860	388,055	1,874	+894	381,483	375,112	6,371	39,200
1951	9	24,863	322,420	...	+222	317,645	313,323	4,322	29,860
1950	9	46,940	309,084	...	-1,875	329,286	323,516	5,770	24,863
1949	8	31,806	246,827	...	+2,741	234,434	223,639	10,795	46,940
1948	7	29,760	210,920	512	-391	208,995	199,778	9,217	31,806
1947	7	24,621	172,725	123	+906	168,615	163,619	4,996	29,760
1946	7	14,650	145,044	578	+3,834	139,485	136,101	3,384	24,621
1945	9	14,620	112,932	...	+577	113,479	112,303	1,176	14,650
1944	9	18,711	126,484	...	+508	131,083	129,846	1,237	14,620
1943	9	21,934	132,292	365	-457	135,423	134,757	666	18,711
Wet-base goods									
1953	7	2,994	11,768	...	-1,366	10,219	[illegible]	2,197	3,177
1952	7	3,235	12,405	...	-407	12,239	7,300	4,939	2,994
1951	7	3,313	13,659	...	+380	14,117	11,888	2,229	3,235
1950	7	3,677	11,141	1	+137	11,643	6,996	4,647	3,313
1949	6	2,557	10,921	44	-184	9,661	5,368	4,293	3,677
1948	7	3,282	11,069	2	-77	11,719	9,797	1,922	2,557
1947	7	2,451	11,241	70	-26	10,454	9,240	1,214	3,282
1946	7	2,804	8,631	...	+286	9,270	5,225	4,045	2,451
1945	7	2,359	7,023	...	-211	6,367	3,904	2,463	2,804
1944	7	2,894	8,433	...	-143	8,825	7,292	1,533	2,359
1943	7	1,448	7,840	311	+423	7,128	6,002	1,126	2,894

[1]Plant count based on December reports.

[2]Stocks at the beginning of the year differ from the quantities held at the end of the preceding year because 11 additional plants were added to the survey in January 1950, and 3 plants in January 1953.

It won't come from plants without safety programs, which are the ones most in need of it.

It won't come from plants with paper programs which are fooling others, but not themselves.

General Pershing, before returning to America after his victorious leadership in World War I, was told that war nerves and other associated factors were causing a moral degeneration in America which would be accelerated by the return of American soldiers. He replied that if he had just 12 men who believed in the true Christian doctrines and were willing to exert all their efforts and leadership, their influence would be great enough to cause a spiritual revival in this country.

Industry Leadership

Twelve men in the fertilizer industry like Vernon Gornto, Curtis Cox, Ed Burroughs, Tex Watts, or others you might know as we in North Carolina know these four, can lead the fertilizer industry to an effective solution of those injury problems. Such leadership has been developed in other industries such as the steel, textile and cement industries, and the results have been phenomenal.

Every man here in the fertilizer industry has an opportunity for such leadership. In the nation and state, the opportunities for improving the safety situation in the fertilizer industry are untold. The state agency, charged with accident prevention work, the National Safety Council, commercial insurance carriers, trade associations and national company organizations offer opportunities for the improvement of accident prevention work in the fertilizer industry. If you men who are doing a worthwhile job in your plants can make your desires known and take the proper action, others in the industry will soon climb upon the band wagon.

Although the facts aren't too encouraging, the future can be bright in the fertilizer industry if each of you, as a leader, does his bit. To conclude, let me again paraphrase the Christophers and say: "If everyone would light just one little candle, what a bright world this would be!" ◆

Safety Section Group Meets

Three Year Plan Adopted, Begin Motivation Project

THE mid-year meeting of the Advisory committee, Fertilizer Section, National Safety Council was held at White Sulphur Springs, W. Va., on June 13, between APFC and NFA conventions.

Tom Clark outlined the Employee Motivation Project which has been instituted to secure field data on fertilizer industry personnel for the development of safety training aids to maximum effectiveness.

Dr. Charles W. Nelson of the University of Chicago, Industry Relations Center, has been selected to head the survey. Costs of about $2,500 will be underwritten with contributions from member firms of the section.

An observer will be placed in a "typical" fertilizer plant for two weeks to a month to familiarize him with work habits of the labor force. After this period, he will spend a few days in other plants to check his observations against experiences there.

Survey Report

The survey report will include a check list of points to be observed in interviewing prospective employees, which may help in eliminating those most accident prone; information on work and learning habits and motivation patterns of workers and general data to enable supervisory forces to teach and direct more effectively.

The committee, headed by Chairman Vernon Gornto, unanimously accepted the outline of a Three Year Safety Program as outlined in an accompanying diagram. This project was developed by a committee, composed of Tom Clarke, Curtis Cox and Wayne High, with John E. Smith in charge.

R. G. Diserens was appointed to compile data on Workman's Compensation Insurance rates in response to a letter from M. F. Wharton.

Ralph Fraser and Charles Best, who retired from the committee, were presented with scrolls, prepared by Tom Clarke, which entitled them to become full Piscatorial Doctors. Both were praised for their efforts and contributions to the work of the Fertilizer Section, NSC.

Memphis, Tenn., was selected as the site for the next committee meeting, scheduled for Dec., 7. ◆

Three Year Safety Plan

1955

Improve plant physical layout and personnel.
Increase membership in Fertilizer Section, up interest and participation in contests and meetings.
Better visual aids and information system.
Cooperation with state labor departments.
Promote field study, check insurance costs, establish research committee, develop new key personnel, encourage aid of suppliers in small plant safety.
AIM: 10 per cent reduction in frequency rates, 20 per cent in severity rates.

1956

Continue 1955 program and—
Possible safety training program for plant supervision.
Long look at industry insurance rates.

1957

Continue 1955 program and—
Repeat school if warranted, add advanced course if demanded.
Look for marked decrease in insurance costs if program is successful.

Canadian Plant Food Convention

F. G. Sherry, H. J. Baker & Bro.; Fraser Ross, Canadian Industries Ltd.; S. B. McCoy, Int. Min. & Chem. Corp. and C. W. Jarvis, Canadian Industries Limited.

Mr. and Mrs. Earle M. Grose, United Co-operatives of Ontario; Mrs. William Caspari, Jr. and R. B. Lenhart, of Cooperative G.L.F. Exchange, Inc., New York City.

Mr. and Mrs. H. H. Skelton, Canadian Industries Limited, Montreal, and Mr. and Mrs. J. F. Driscoll, International Fertilizers Limited, St. John, N. B., Can.

Coleman, Wilson and Albrecht on Program

FOR THE NINTH consecutive year the Plant Food Producers of Eastern Canada met. This year it was on July 1 to July 4, at the magnificent Manoir Richelieu Hotel at Murray Bay, Canada.

Although the number of fertilizer industry members is small in Canada, the meeting had an attendance of 130. This, of course, included members and their wives, plus a goodly number of industry visitors from the United States.

The meeting opened with a banquet on Thursday evening under the toastmastership of the association's president, Alex Mooney, of Canada Packers Limited, Toronto. The main talk was given by the well-known and popular Tom S. L. Pope, president, International Fertilizers Limited, Quebec.

The following day's program was devoted to the principal speakers. The morning session was carried by Dr. William A. Albrecht of University of Missouri, Columbia, Mo., whose subject was "Developments in the U. S. A. on Fertilizer Usage."

Dr. Russell Coleman, president of National Fertilizer Association, Washington, D. C., was the next speaker who talked extemporaneously on the fertilizer industry as he saw it in both the United States and Canada.

First speaker of the afternoon session was Dr. P. O. Ripley, chief, Field Husbandry Division, Experimental Farms Service, Department of Agriculture, Ottawa. Dr. Ripley spoke on the many phases of agriculture in Canada and the problems encountered due to the climatic conditions in various parts of the Dominion.

The second and last speaker of the afternoon was Louis Wilson, director of information, American Plant Food Council, Washington, D. C., who spoke on public relations and its importance to the industry.

The remaining days of the meeting were devoted mainly to golf, for which delegates found the weather made to order in the popular vacation land of Canada.

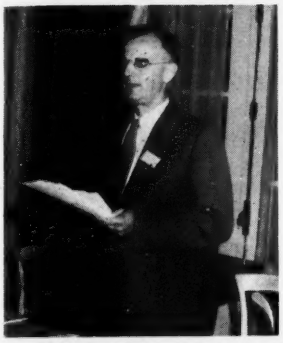
◆

Alex Mooney, Canada Packers Ltd. and William Caspari, Jr., Davison Chem.

Mr. and Mrs. R. C. Eakin, of St. Regis Paper Company (Canada) Limited, Montreal, P. Q.

T. S. L. Pope, International Fertilizers Ltd. and C. E. Littlejohn, U. S. Potash Co., Inc.

Mrs. and Mr. J. B. Gnaedinger, Aluminum Co. of Canada Ltd., Wakefield, P. Q.



UPPER LEFT: J. W. Hall, Potash Co. of America, and Dr. and Mrs. W. A. Albrecht, U. of Mo. ABOVE: Mr. & Mrs. R. B. Lenhart, Coop, G.L.F. Exch.; Basil Wagner, Jr., Davison Chem. Co. and Mrs. and Mr. D. D. Culver, Huston Culver Fert., Inc. UPPER RIGHT: R. A. Stone, Wm. Stone Sons Ltd.; Mrs. and Mr. E. M. Kolb, Amer. Pot. & Chem. Corp; Mrs. and Mr. James Totman, Summers Fert. Co. and Mrs. and Dr. P. O. Ripley, Dom. Dept. of Agr.

LEFT: Dr. P. O. Ripley, Dominion Dept. of Agriculture. RIGHT: Louis Wilson, APFC, and Russell Coleman, NFA.

BELOW LEFT: Mrs. W. T. Doyle; Mrs. and Mr. R. H. Gray, Aluminum Co. of Canada Ltd. and W. T. Doyle, Sturtevant Mill Co. BELOW: James Totman, Summers Fert. Co.; V. B. Lillie, Can. Ind. Ltd. and E. W. Harvey, Nitrogen Div. BELOW RIGHT: Mr. and Mrs. G. W. Michael, Dom. Dept. of Agr. and T. S. L. Pope, Int. Fert. Ltd.

Fertilizer Safety Conferences

SAFETY conferences at Baltimore, Md., Norfolk, Va. and Raleigh, N. C., during May were well attended by members of the fertilizer industry. At Norfolk, on May 21, a large group heard an excellent program topped by an address by Paul T. Truitt, president, American Plant Food Council.

Truitt, speaking on enthusiasm for safety, pointed out that fertilizer manufacturers charge off from three to four per cent of labor costs per year against accident costs. Because the industry is currently operating at about 79 million manhours annually and the average wage is $1.46 per hour, the total gross labor cost is nearly 115 million dollars per year.

Assuming an average labor-loss cost of 3.5 per year, the industry is losing manhours worth four million hours, according to the APFC head. Considering that indirect costs are normally four times more than direct, Truitt continued, accidents are costing the industry about 20 million dollars per year.

Baltimore Meeting

On May 7 at Baltimore, a well-rounded schedule was carried out by the Fertilizer section of the Governor's Safety-Health conference.

The dependence of our standard of living on chemicals was pointed out in an address by Dr. Vincent Sauchelli, Davison Chem. Co. div., who said that this fact is not generally recognized because the benefits of chemicals are chiefly indirect and are not easily seen or appreciated by the public.

Using colored slides of plant scenes, T. J. Clarke, GLF Soil Building Service, conducted a contest on the observation of plant safety defects.

Paul Grundman, Armco Steel Corp., gave a talk and demonstration on the use of mechanical and electrical models in teaching accident or fire prevention to employees.

In the second half of the Virginia program, Vernon S. Gornto, Smith-Douglass Co., and general chairman, Fertilizer section, NSC, reviewed the organization and growth of the section.

A case history panel evoked considerable discussion from the floor and resulted in a discussion of accident prevention information. ◆

CSMA Papers

Discuss Household Pesticide Trends, Pressurized Sprays

SEVERAL marked trends in household insecticides were seen by G. A. McLaughlin, president, McLaughlin, Gormley, King & Co., in his paper delivered before the Insecticide Div., Chemical Specialties Manufacturers Assn. at its recent Cincinnati meetings.

McLaughlin pointed out that people apparently consider simplicity of use highly important and prefer materials easy to store and easy to use when needed. As evidence he cited the rise in popularity of pressurized sprays designed to throw a coarse stream of relatively large particles. Because they are convenient and effective, he feels that sales in the future will be successful.

Another advantage of these pressurized units is the speed with which they act—another consumer preference. Manufacturers, said McLaughlin, noted the misuse of aerosols when attempts were made to hit a particular insect rather than fill the room with fog. When a customer aims a pressurized spray at a fly, trying to get it on the wing, the effect is like "hitting the fly with a hammer"—which could well result in increased sales through rapid, visible action.

A trend towards specificity of products was reviewed by McLaughlin who considered this most marked in aerosols. The market now has a multitude of materials for treating cloths for moth damage, wall brackets, mechanical devices and other specialities.

Some feel, continued McLaughlin, that there may also be a trend towards more odor-free materials. He noted that most aerosols and many sprays have a characteristic odor often because of the chlorinated insecticides for which special solvents are used. He cited methylene chloride as a solvent now widely used in aerosols to reduce both odor and cost. Work is being done on odorless solvents and some new toxicants have little odor and require none of the troublesome solvents.

In marketing, the trend toward sale through food outlets may result in the production of smaller packages, better design and more extensive advertising-promotion.

McLaughlin felt that so far as legislation is concerned, in regard to insecticides, companies doing a national business may be "hopelessly immobilized in red tape" unless some uniformity occurs. One bright spot—relatively non-toxic and non-flammable materials may eventually be controlled by less restrictive regulation.

Garden Sprays

Harold E. Rife, entomologist, Boyle Midway, Inc., also considered the development of pressurized garden sprays in his paper. A 12 ounce home garden aerosol unit applied correctly will, said Rife, furnish adequate control for an average size yard.

Some of the satisfactory diluents, solvents and propellants pointed out by the speaker included the alcohols (especially ethyl alcohol), methylene chloride, methyl chloride, dichlorodifluoromethane (Freon and Genetron 12), trichlorofluoromethane (Freon and Genetron 11) and Solvent C (U. S. Industrial Chem. Corp.).

Use of vegetable oils, Rife continued, has been generally unsatisfactory because of heavy oil deposits remaining on plants after application. S/V Sovaspray alone has overcome the problem of phytotoxicity; however, with the addition of some solvents and toxicants, plant injury was noted in tests. A combination of the oil or other isoparaffinic oil, solvents and insecticides might be worked out, Rife suggested.

He named as some insecticides already used in such products—rotenone pyrethrins, rotenone, lindane, piperonyl butoxide, piperonyl cyclonene, DDT and methoxychlor. Possible synergists for pyrethrins in these formulations include n-propyl isome, MGK-264 and sulfoxide.

Rife emphasized that because toxicants are much more concentrated than in the usual sprays, effective control is obtained by a light application. Use is considered especially adaptable for spot treatment of new growth where a complete spraying is not necessary.

Greenhouse Application

The use of pressurized insecticides for use in greenhouse, home and field applications was reviewed by Floyd F. Smith, senior entomologist, Entomology Research Branch, USDA. Smith pointed out that a readily available and effective insecticide such as an aerosol or a pressurized solution is needed by home owners and he expects demand for such products to increase with time as new formulations are available and as their efficiency increases.

In florist greenhouses, parathion is more generally used than all other aerosols, said Smith, who added that this toxicant is almost universally used in vegetable houses as well.

Substitutes for control of some flower pests have included sulfotepp aerosols for soft scale; sulfotepp, Ovotran, schradan, dementon, Aramite and chlorobenzilate for resistant spider mites and malathion for thrips.

Smith stated that although some highly resistant colonies of mites are better controlled by sprays of Aramite or schradan alone or in combination, sulfotepp, schradan and Aramite are most widely used.

For field crop applications the cost of pressurized insecticides is too high in comparison to the usual dusts and sprays and so they have

not been generally adapted. Smith also pointed out that fungicides cannot be incorporated as with the more usual spray materials.

Pests of ornamentals against which pressurized solutions will be useful, said Smith, include aphids, spider mites, plant bugs, Japanese and other beetles, caterpillars, most scales, mealybugs, centipedes and sowbugs. He added that slugs, snails, garden symphilids and some scales may not respond to such treatment.

Smith cited aphids, thrips, whiteflies, spider mites, soft scale, hemispherical scale, ivy scale, fungus midges and springtails as household pests which will respond to pressurized insecticides, in varying degrees. ◆

Potash Production at New High

Potash, 1953

		1952	1953
Production of potassium salts (marketable)	short tons	2,866,462	3,266,429
Approximate equivalent K_2O	do	1,665,113	1,911,891
Sales of potassium salts by producers	do	2,757,252	2,965,986
Approximate equivalent K_2O	do	1,598,354	1,731,607
Value at plant		$53,754,316	$59,620,083
Average per ton		$19.50	$20.10
Imports of potash materials	short tons	[1] 357,437	253,113
Approximate equivalent K_2O	do	[1] 188,441	130,362
Value		[1] $12,714,434	$9,940,581
Exports of potash materials	short tons	101,200	88,208
Approximate equivalent K_2O[2]	do	56,281	49,109
Value		$4,836,659	$3,936,415
Apparent consumption of potassium salts[3]	short tons	[1] 3,013,489	3,130,891
Approximate equivalent K_2O	do	[1] 1,730,514	1,812,860

[1] Revised figure.
[2] Estimate by Bureau of Mines.
[3] Quantity sold by producers, plus imports, minus exports.

World Potash Production

Country[1]	1952 Potassium salts	1952 Equivalent K_2O	1953 Potassium salts	1953 Equivalent K_2O
North America:				
United States	2,600,397	1,510,557	2,963,239	1,734,429
South America:				
Chile	([2])	([2])	([2])	([2])
Europe:				
France (Alsace)	6,238,000	1,055,000	5,850,000	1,030,800
Germany:				
East Germany	([2])	1,803,000	([2])	[3] 1,900,000
West Germany	12,585,300	1,553,700	[3] 12,075,000	[3] 1,520,000
Spain	1,215,636	181,086	1,052,376	181,356
Asia:				
India	8,519	4,267	([2])	([2])
Israel	—	—	5,164	3,098
Japan	2,614	157	([2])	([2])
Australia:				
New South Wales	319	24	—	—
Total (estimate)	—	6,400,000	—	6,700,000

[1] In addition to countries listed, China, Ethiopia, Italy, Korea and U.S.S.R., are reported to produce potash salts; estimates included in totals.
[2] Data not available; estimate included in total.
[3] Estimate.

Domestic production of potassium salts in 1953 again reached a new high as sales and apparent consumption increased 8 and 4 per cent respectively over 1952. Figures in a Bureau of Mines report on the potash industry in 1953 show stocks in producers' hands at the end of the year at 470,051 short tons (287,508 tons K_2O), more than double the 1952 figure.

Both imports and exports of potash materials were less in 1953 with West Germany, East Germany, France, Spain and Chile, respectively, supplying 34, 21, 20, 17 and 5 per cent of the 253,113 tons imported. Exports were 88,208 tons, 13 per cent less than in 1952, most of which went to countries in the Western Hemisphere.

Production of high-grade muriate and sulfate of potash increased 19 and 6 per cent respectively while that of lower-grade muriate and manure salts was considerably less than in 1952. New Mexico supplied 90 per cent of the domestic production. ◆

1953 PRODUCTION

Grade	1953
Muriate of potash:	
60-62 per cent K_2O min.[1]	2,926,398
48-50 per cent K_2O min.	81,801
Manure salts	4,628
Sulfate of potash and of potash-magnesia	253,602
Total	3,266,429

[1] Includes refined potash and some 93-96 per cent KCl.

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Pest Reports

Grasshoppers Serious In Several States

In addition to being rangeland problems, grasshoppers are becoming serious crop problems in several states. Although some spraying has been done in Idaho for rangeland grasshopper control, natural factors have been very instrumental in reducing the populations.

In Lincoln county, reductions of from 400 per square yard to as low as one per square yard were attributed to dry weather, low temperature and other weather factors. In Minidoka county a predaceous wasp was also very active.

Control programs for rangeland have been developed and in most instances are under way. Colorado expects to spray approximately 200,000 acres in southeastern counties; New Mexico will treat 165,000 in the Folsom-Cimarron Canyon and Chama-Antonio areas and in Wyoming about 122,000 acres in Park county, 10,000 acres in the Guernsey area of Platte and Goshen counties and 26,000 acres in Johnson county will be treated.

In the Ephraim-Manti, Utah area 20,000 acres of native meadowlands had populations of serious proportions. One species had populations exceeding 1,000 per square yard in the hatching beds. Over 28,000 acres have been sprayed in this state and the grasshopper situation is the most serious in several years.

In southeastern Kansas the infestation was of outbreak proportions with widespread damage to corn, alfalfa, soybeans, grasses and garden crops. Missouri was experiencing rather serious populations throughout the State with second generation *Melanoplus mexicanus* adding to the complexity of the situation in the southern half. Other states which have reported grasshoppers in threatening numbers or requiring control measures include Iowa, Minnesota, Illinois, Indiana, Kentucky, Maryland, Virginia, Texas, Oklahoma and Nebraska.

European Corn Borer

By early July insecticidal treatment for first-brood European corn borer was practically completed in Iowa. Egg and larval counts have been markedly higher than in recent years and infestation as indicated by plant injury ranges up to 100 per cent generally over the state.

Although not necessarily the case, as a general rule treatment for field corn is usually considered profitable if 50 or more egg masses per 100 plants are present or if extensive leaf feeding is present on early corn and the corn is more than 35 inches in extended height during first-brood flight.

In the early part of the month Iowa had egg mass counts up to 400 per 100 plants in isolated fields.

Based on material received from Economic Insect Survey Station, Plant Pest Control Branch, Agricultural Research Service, USDA, supplemented with information received by FARM CHEMICALS *from Federal and state agencies.*

In the central area counts were 150 masses per 100 plants and in the northern area masses averaged 20–50. In Illinois counts ranged from 26 to 237 egg masses per 100 plants with hatch complete.

Minnesota had one of the shortest and most concentrated egg-laying periods in several years. Highest infestations were found in the southwest area where 73 of every 100 plants examined were infested. One-hundred per cent shot hole injury was reported as common in southeast South Dakota and 80 per cent of most early corn in Saunders and Dodge counties, Neb., had 12 borers per stalk.

Forage Crop Damage By Garden Webworm

The garden webworm was one of the principal economic insects during early July. Kansas reported that this insect made it necessary to prematurely cut alfalfa in localized areas, thereby reducing hay production.

Although general over the state, the heaviest populations were in the north central, southern and eastern counties where counts ranged from 50 to 200 larvae per square yard.

In southwest Iowa soybeans and corn were being damaged. Missouri reported the insect generally over the state with populations in the Missouri and Mississippi river bottoms reaching four to 56 larvae per linear foot of row with damage to corn, soybeans and alfalfa.

Although by the second week in July the larvae were reaching maturity in Missouri another brood of larvae is expected throughout the state. Nebraska reported severe damage in many fields of alfalfa and late-planted corn.

Cigarette Beetles

In a recent report, J. N. Tenhet of the Stored-Products Insect Section, Agricultural Marketing Section, advises that early infestations of the cigarette beetle appeared approximately two to three weeks earlier in North and South Carolina tobacco warehouses than usual.

The overwintered brood emergence of this insect was unusually heavy. Based upon these early populations it is believed that very severe beetle infestations may be expected in the eastern and mid-Piedmont areas of these states this season. In some cases infestations already approach outbreak proportions.

In the Richmond, Va. area the emergence is about normal and heavy infestations are not expected. The same is true for the tobacco moth with emergence and populations expected to be about the same as the past three or four years.

Other Important Insects

Other cereal and forage insects which caused damage during July include chinch bugs, armyworms, corn earworms and aphids. Chinch bugs moved from small grain fields to corn in Kansas where populations up to 500 per hill, with loss of some corn plants, were reported. Spotted armyworm outbreaks occurred in South Dakota, Wisconsin and Michigan while heavy aphid infestations continued in alfalfa in Arizona and New Mexico.

Fruit insect conditions were about normal for the month: Or-

chard mites were increasing in New Jersey, Delaware, Pennsylvania and other areas; second-brood codling moth was requiring attention and apple maggot flies were emerging from Rhode Island to Minnesota.

Among truck crop insects showing abundant and damaging populations during the month were Mexican bean beetle in areas of Rhode Island, New York, North Carolina and Colorado; squash bug in New Jersey, Tennessee and Illinois and thrips on onion in Delaware, Virginia, Utah and Colorado. ◆

Cotton Wilt

Three Texas Experiment Station Workers point out, in the PLANT DISEASE REPORTER, the possible influence of salt level in the soil on the occurrence of verticillium wilt in cotton.

In field and pot studies they found that aside from several obvious exceptions, as the salt concentration in the soil increases, severity of wilt in cotton decreases. In the 1950 cotton leaf samples which were examined, concentration of sodium was about four times greater in the non-wilt plants than in those severely affected with the disease.

The authors point out that high double beds and farrowing, which have been found to reduce amount of wilt, could have the effect of increasing the salt level in the root zone of the plant. In addition, severity of wilt usually increases with a rise in soil moisture, which also tends to lower salt concentration in the soil solution.

It should be pointed out that this is suggested as just one of the factors involved in the wilt problem.

Ga. Weed Control

Cotton weed control tests in Georgia during 1953 involved experiments with CIPC, CMU and DNOSBP, according to a state experiment station bulletin. CIPC was found effective for longer periods of time than the other materials and apparently is not so easily leached from the soil. However, it did not control ragweed and coffee weed nearly so well as CMU.

It appears that under some Georgia conditions DNOSBP is too toxic for pre-emergence use, especially at a rate of 12 pounds per acre. On the sandier soils of the Coastal Plain, CMU did not give satisfactory control, but in the Piedmont and Limestone valley sections, good control was obtained.

At Experiment, Ga., applications of Chloro-IPC at 6 and 9 pounds and CMU at 1½ and 2 pounds resulted in yields not significantly different from the hoed checks.

Here are current recommendations for the use of herbicides in cotton in Georgia as outlined in the bulletin:

Pre-emergence, Coastal Plain: 6–7.5 lbs./acre CIPC.

Pre-emergence, Piedmont & Limestone valley: 7.5–9 lbs./acre CIPC or 1.5–2 lbs./acre CMU.

Post-emergence, all three areas: 5 gal. non fortified oil applied to the band for each oiling.

It was pointed out that perennials such as Bermuda and Johnson grass are not controlled by the rates given above, and it was stated that chemical weed control will not be useful if perennials constitute a large portion of the weed population.

CALENDAR

Aug. 10-12—Ohio Pesticide Institute summer tour from Wooster to Northwest O.

Aug. 11—Annual Kentucky Fert. conf., Guignol Theater, U. of Ky., Lexington.

Aug. 17-21—25th Rocky Mt. Conf. of Entomologists, Cameron Pass 4-H Club Camp, 45 mi. west of Ft. Collins, Colo.

Aug. 25-27—American Phytopathological Society with the Pacific Div., APS, and the Potato Assn. of America, joint annual meetings at the YMCA Conference Camp, Estes Park, Colo.

Sept. 6—National Joint Comm. on Fert. Application and Amer. Society for Hort. Science, Univ. of Fla., Gainesville.

Sept. 8-10—NAC meeting, Spring Lake, N. J.

Oct. 6-7—Fifth annual conv., Pacif. N.W. Plant Food Assn., Sun Valley, Ida.

Oct. 15—Assn. of Amer. Fert. Cont. Officials, Shoreham Hotel, Washington, D. C.

Oct. 16—Assn. of Econ. Poisons Cont. Officials, Washington, D. C.

Oct. 18-19—Fertilizer Section, National Safety Congress, Chicago, Ill.

Oct. 25-29—American Soc. of Agronomy meeting, Minneapolis, Minn.

Nov. 3-4—Annual S. C. meeting for fert. dealers, salesmen and mfrs., Clemson, S. C.

Nov. 8-12—Amer. Society of Agronomy, St. Paul, Minn.

Nov. 10-12—NFA Southern convention, Hollywood Beach hotel, Hollywood, Fla.

Nov. 15-16—Calif. Fert. Assn., Coronado, Calif.

Nov. 15-16—Eastern Branch, ESA, New York City.

Phosphorus Test

A new USDA circular describes the baking soda test for determining plant-available phosphorus in soils which was devised by department workers in cooperation with the Colorado Agricultural Experiment Station.

Relatively simple and inexpensive to make, the test employs a water solution of sodium bicarbonate to extract phosphorus from soil samples, permitting a good approximation of the amount a soil can provide to growing plants. The method is designed for soil-testing labs and not for farm use.

Main advantage is said to be the fact that satisfactory results are obtained on a wide range of soils including alkaline, neutral and acid types.

The circular, prepared by S. R. Olsen, C. V. Cole, F. S. Watanabe and L. A. Dean of the Soil & Water Conservation Service, can be obtained for 15 cents from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Ask for USDA Circular 939, "Estimation of Available Phosphorus in Soils by Extraction with Sodium Bicarbonate."

April Super Production

April production of superphosphate totaled 214,269 short tons (100 per cent APA), according to the Bureau of the Census, a decrease of 6 per cent from the March output and slightly less than the figure for April, 1953.

Shipments of all grades totaled 154,448 tons, down 6 per cent from March volume but 4 per cent over the April, 1953 figure. Stocks on hand at the end of the month were 21 per cent less than those held on April 1, but 9 per cent more than the quantities on hand as of April 30, 1953.

Literature

A Bibliography of Systemic Insecticides by Paul A. Giang. Publication E-874, March, 1954, Entomology Research Branch, Agricultural Research Service, USDA.

The author has attempted to include all references on the chemistry, pharmacology and insecticidal testing of systemic insecticides that have appeared in literature up to December, 1953. References are arranged alphabetically according to authors and are keyed to indicate the type of material covered—schradan, dementon, other organic compounds or inorganic compounds. It does not include references to systemics that have been tried only on animals.

Anhydrous Ammonia. Data Sheet D-251 published by the National Safety Council, 425 N. Michigan Avenue, Chicago 11, Ill. 12 pages. Price: 17 cents to members, 34 cents to non-members. Quantity prices available from NSC.

This Data Sheet is the first technical publication of the newly formed Fertilizer section, and is said to be the most up-to-date treatment of the subject in print. Included are many illustrations, charts, tables and diagrams, and information on toxicology, maximum allowable concentration, shipping containers, bulk storage, personal protective equipment, first aid and detection.

Production - April, 1954

Compiled from government sources

Chemical	Unit	April 1954	April 1953	March 1954
Ammonia, synth. anhydrous	s. tons	232,246[1]	188,173	237,535
Ammonia liquor, coal & coke (NH_3 content)	pounds	3,503,535	4,266,850	3,538,074
Ammonium nitrate, fert. grade (100% NH_4NO_3)	s. tons	125,457	102,943	131,892
Ammonium sulfate				
synthetic (technical)	s. tons	74,414	47,106	79,203
coke oven by-product	pounds	130,921,736	159,783,813	142,926,392
BHC (Hexachlorocyclohexane)	pounds	7,236,610	6,523,835	6,372,722
Gamma content	pounds	1,121,398	881,805	901,371
Calcium arsenate (commercial)	pounds	——	276	——
Copper sulfate (gross)	s. tons	6,854	——	6,656
DDT	pounds	8,750,416	10,315,872	8,035,605
2,4-D acid	pounds	2,863,245	2,788,973	2,739,774
esters & salts	pounds	2,099,521**	2,477,312	2,514,670
esters & salts (acid equiv.)	pounds	1,621,984**	1,690,279	1,935,911
Lead arsenate (acid & basic)	s. tons	1,539	1,444	1,084
Phosphoric acid (50% H_3PO_4)	s. tons	263,010[1]	210,153	264,625*
Sulfur, native (Frasch)	l. tons	445,158	478,954	472,445
Recovered	l. tons	31,000	28,337	30,000
Sulfuric acid, gross (100% H_2SO_4)	s. tons	1,189,694	1,206,913	1,223,936
Chamber process (100% H_2SO_4)	s. tons	228,234	272,149	230,461
Contact process (100% H_2SO_4)	s. tons	961,460	934,764	993,475*
Superphosphate (100% APA)	s. tons	214,269	219,896	227,696*
Normal & Enriched (100% APA)	s. tons	176,536	181,183	181,684*
Concentrated (100% APA)	s. tons	36,788	37,180	45,050
Wet base (100% APA)	s. tons	945	1,533	962
2,4,5-T acid	pounds	——	533,959	——

* Revised. ** Partly estimated.
[1] Includes quantities for one plant not previously reporting

FERTILIZER MATERIALS MARKET

New York

July 12, 1954

Sulfate of Ammonia. Because this is about the slowest part of the year for the movement of this material and buyers are reluctant to stock up, actual movement was limited to buyers' immediate needs. However, it is pointed out that very little imported material is expected on the market this season.

Nitrate of Soda. No price changes noted in this material.

Ammonium Nitrate. One large eastern producer reduced the price of this material effective July 1. Demand is reported fair.

Urea. Demand was limited to buyers' actual needs with last sales made at $118 to $120 per ton at the ports and domestic material quoted slightly higher in price.

Nitrogenous Tankage. Market is quoted at from $3 to $4 per unit of ammonia ($3.64 to $4.86 per unit N), according to shipping point. Most sellers are asking higher prices for fall and winter delivery.

Castor Pomace. The price of this material remained firm as only one domestic producer was operating. Last sales were made on basis of $27 per ton, f.o.b. production point.

Organics. Organic fertilizer materials were rather steady in price but trading was on the slow side as most buyers have just finished taking inventory for the fertilizer year ending June 30. Soybean meal in bulk for prompt shipment was quoted at $88 per ton, f.o.b. Decatur, Ill. Linseed meal was quiet and the prices appeared headed downward because of the slow demand from the feed trade. Cottonseed meal was available for prompt shipment at about $65 per ton, f.o.b. Memphis. Tankage last sold at $8 per unit of ammonia ($9.72 per unit N), f.o.b. eastern shipping points, with blood quoted at the same price.

Fish Meal. With a better catch reported by local fish factories, the price of fish meal declined to $132 per ton, f.o.b. fish factories. Limited amounts of imported fish meal were available at competitive prices.

Bone Meal. Demand increased from the feed trade recently and available stocks are rather limited, with last sales on basis of $60 per ton, f.o.b. production points.

Hoof Meal. Sales made on basis of $6.75 per unit of ammonia ($8.20 per unit N), f.o.b. Chicago, for prompt shipment.

Superphosphate. Stocks are ample at all points of the 20 per cent material and possible tendency toward lower prices was noted in a few areas. With increased production of triple superphosphate now available, no shortage is looked for in this material during the coming fertilizer year.

Potash. Shipments are going forward on existing contracts with no price changes reported and limited demand noted, with some buyers carrying over material from last season.

Philadelphia

July 12, 1954

Materials market continues without strength in any particular direction. Packing-house by-products are without significant change, and there is not much demand. Menhaden meal is cheaper. Sulfate of ammonia is in easier supply position, but nitrate of ammonia is still behind demand. Normal grade superphosphate is more plentiful, but triple is still somewhat short. Potash prices are higher.

Ammonium Nitrate. Price is reported reduced to $74.50 per ton, in bags, and carloads, f.o.b. Eastern Canada. Production, while improved, is still behind the demand.

Ammonium Sulfate. Supply situation is better, but demand rather slow. Coke-oven grade is quoted at $42 to $46.50 per ton, bulk, depending on shipping point. Synthetic is quoted at $42 bulk, and $47 in bags. Most sulfate of ammonia prices are subject to freight equalization.

Nitrate of Soda. Situation remains unchanged. Prices stay the same, and movement is satisfactorily normal, with supply adequate.

Blood, Tankage, Bone. Blood is still quoted at $8.25 per unit ammonia ($10.02 per unit N) in Chicago area, and $8 ($9.72 per unit N), here in the East. Tankage is priced at $8.25 ($10.02 per unit N), in the West, and easier in the East at $7.75 ($9.42 per unit N). Bone meal stays more or less nominal at $60 per ton. Hoof meal is offered at $7 per unit ammonia ($8.51 per unit N), Chicago area. Demand is rather quiet for all packing-house products.

Castor Pomace. This is in limited supply and nominal at $27 per ton.

Fish Scrap. Because of better supply conditions, menhaden meal is priced lower at $135 per ton, with scrap at $130.

Phosphate Rock. Demand for domestic use has slowed down, but export shipments are reported as favorable. Production has increased and supply is ample.

Superphosphate. While situation is rather quiet, it is said that in some spots strong pressure is being exerted to make sales. There is no scarcity of normal, but triple grade is still rather short.

Potash. Prices have now been advanced with Trona, Calif., quoting muriate at 49 cents per unit K_2O, in bulk. New Mexico is quoting muriate 39½ to 40½ cents per unit, manure salt 19 cents and sulfate of potash 70 cents per unit. Potassium magnesium sulfate is tagged at $15.05 per ton. These are all f.o.b. Carlsbad, and effective July 1 to Nov. 30, 1954.

New Herbicide

May Solve Johnson, Nut Grass Problems

A NEW herbicide from General Chemical Div. may prove to be the answer to the Johnson grass problem for growers in the Cotton belt who have long been plagued by this pest. Although data is not yet complete, tests have shown that General Chemical's HCA Weed Killer will successfully control both Johnson and nut grass.

Additional trials this season are expected to provide a much better picture of the potentialities of this promising material.

Fortified Oils

Last year in tests at the Texas Agricultural Experiment Station which produced results termed "remarkable" by researchers, the HCA was used as a fortifying agent for diesel and other oils.

A single treatment with the fortified oils is reported to kill 80 to 90 per cent of treated clumps, including rootstocks. A second or third application usually provided complete control. Unfortified oils require four to six or more doses for minimum control.

As little as one part of HCA in 31 parts of oil is required for control, and application is by spot oiling plant crowns with a low pressure or gravity feed sprayer.

Present Trials

General Chemical is now making the material available to qualified growers for large scale on-the-farm tests on a country wide basis. Other trials are underway at agricultural experiment stations, including the Texas A&M unit where HCA is being used on a 200 acre cotton plantation.

It can be applied at any time in cotton and non-crop areas up until the Johnson grass stems glaze over. Where growth is thick, mowing just prior to treatment has facilitated application. In alfalfa, the best time is said to be just after cutting and removal of the crop. Spring treatment in young alfalfa has also been effective.

The material may prove a real boon for growers who have been long plagued by Johnson grass and who have found previous treatments either ineffective or too expensive and destructive. Some materials that have controlled the weed also have sterilized the soil for periods of 10 years or more.

Provided that current tests prove up to expectations, commercial production of the HCA Weed Killer is slated for next year. ◆

Alphabetical List of Advertisers

editorial

Bill Passed; Ferti-Liquid Gimmick

AS WELL reported by our Washington editor, John Harms, the Miller Bill is at last a reality. Passage and signing by the President followed addition of a fee proviso permitting the Food and Drug Administration to obtain industry assistance in paying for tolerance establishment work. Although the formula is not a part of the amendment, John indicates that the method will follow that of present certification programs.

Lea Hitchner, NACA executive secretary and leading industry spokesman in the Miller bill hearings, had previously indicated that there were no industry objections to a fee provision providing that it was to be a national policy. Charles Crawford, FDA Commissioner, on previous occasions had requested such a provision, and it was finally added by the Senate Labor and Public Welfare committee.

In commenting on passage of the bill, Hitchner repeated his previous statements that the industry has already been meeting most of the provisions for many years and added that it "should allay the fears of critics who have unjustifiably claimed that the pesticides industry has assumed no responsibility for keeping harmful residues of pest control chemicals out of the feed supply."

Advantages outlined by Hitchner include assistance to agricultural colleges in preparing dust and spray schedules and assurance to the farmer that if label directions are followed crops on which pesticides are used will not have harmful residues.

According to FDA, technical work on tolerances has been completed and there remains only administrative action in approving and announcing the limits. Previous tolerance hearings have expedited this phase of the program.

AS OUTLINED in a recent statement by Hitchner, the law establishes a simple procedure for setting tolerances which begin with the filing of a petition for tolerance establishment, accompanied by supporting data. The procedure would be initiated by the Secretary of Health, Education and Welfare or by other interested parties filing a request for the establishment of a tolerance together with adequate supporting scientific data. In most cases, tolerances would be established by regulation following discussion and review of the data.

Provision is made for use of an impartial advisor panel nominated by the National Academy of Sciences, and in the event of differences of opinion, hearings can be held under the Administration Procedure Act and provision is made finally for judicial review.

The Secretary of Agriculture determines the usefulness of a pesticide in agriculture and the final action reflects the decision of both departments.

Although we have the law there are at least three items still to be observed. First of all, the probable industry-government sessions to work out existing problems, the release of tolerances on existing pesticides and the fee program for tolerance establishment work.

We would like to congratulate Hitchner and the NAC association for a fine example of the work that can be accomplished by an industry trade association. An excellent job has been done in upholding the industry viewpoint while at the same time cooperating in the development of legislation that will benefit all interested parties.

MOST columnists seem good for one or more columns each year concerning farm chemicals —the use of insecticides, despair of the home gardener, marvels of fertilizer or other sure-fire human interest topics. The authors seem particularly susceptible at times when reports on the ravages of grasshoppers reach the front page of city papers accompanied by pictures of the first amateur-grown tomato in the vicinity or shots of the local night blooming some-thing-or-other.

Ivan H. Peterman is no exception and it was interesting to scan his July 18 column and find the name of Don Vierling, proprietor of the Atomic Basic Chemical Co., Pittsburgh, and Clover Chemical Co., Eighty Eight, Pa.

Reporting on a chance encounter with Vierling in New York, Peterman seems fascinated by what he terms the "ferti-liquid gimmick". As a result of the meeting Peterman not only got a column but also received from Vierling a supply of his wonder food complete with spray gun and mixing unit. At last report the author was highly pleased.

This is of no real significance except to show how the "ferti-liquid gimmicks" really make things grow —Ivan got a column, his plants are bursting out all over, the industry has had a shot in the arm, Don received some good, practically free publicity and we come out with a solid page of copy.

—GEO. P. TEEL, JR.
Managing Editor

FREE INFORMATION to help you solve fertilizer, pesticide problems

Reader Service

228—Formulating Methoxychlor

DuPont has released a bulletin on the use of 90 per cent technical methoxychlor oil concentrate in fly sprays and aerosols. Included is knockdown data and suggestions for formulation in general contact and space sprays as well as aerosol dispensers, common livestock sprays and pressurized cattle sprays. It also has technical information on solubility, type of solvents and emulsifiers, tables showing fast knockdown action as compared to DDT, etc.

CIRCLE 228 ON SERVICE CARD

229—Super Gas Scrubber

The Chemical P–A Cyclonic Scrubber made by Chemical Construction Corp. removes from 96 to 98 per cent of fluorine from the exhaust gases of superphosphate plants. The units can be installed at surprisingly low cost, says CCC, and feature full utilization of corrosion resistant materials with low operating, maintenance and initial costs. Consumption of water and power is also low. For a copy of the company's latest bulletin

CIRCLE 229 ON SERVICE CARD

230—Acid Tests

Field test data on 60 coatings systems subjected to sulfuric acid spray is shown in a Carboline Co. service bulletin. The rusty steel panels were suspended outside in a 7 per cent acid mist at 130°F developed by acid flowing over a weir. Results show that both primer and finish selection are important.

CIRCLE 230 ON SERVICE CARD

231—Nitrogen Storage

Tanks for storage of low-pressure and non-pressure bulk nitrogen solutions have been added to the Butler Mfg. line. Two types of special alloy, non-corrosive aluminum bulk storage units include bolted vertical 22,000 gallon non-pressure tanks and welded horizontal 12,000 and 22,000 gallon low pressure models. For more information

CIRCLE 231 ON SERVICE CARD

232—Up Sales With Smirow

For sales growth use Smirow tankage to assure top fertilizer quality, suggests Smith-Rowland Co. This is a 100 per cent organic material running consistently high in water insolubility and availability, testing about 90 per cent. To obtain samples and prices

CIRCLE 232 ON SERVICE CARD

233—Moly for Crops

One ounce of sodium molybdate per acre has increased crop yields as much as one ton of limestone in some areas, says the Climax Molybdenum Co. This element is most often needed on acid soils and application may reduce or eliminate lime needs on some soils. For a bulletin, "Testing for Molybdenum Deficiency"

CIRCLE 233 ON SERVICE CARD

234—3-In-1 Applicator

The new Microsol 403D field unit from Silver Creek Precision Corp. is a three in one unit which can produce aerosol mists or be used with jet head director or directional fantail. The pesticide applicator can be used for fly and mosquito control with oil solutions; larviciding and adulticiding with water emulsions and oil miscible toxicants; larviciding with the gun jet or even crop dusting. The producer says positive control is offered over a greater distance than with any other unit. For information and the name of your nearest representative

CIRCLE 234 ON SERVICE CARD

How to use the READER SERVICE CARD

- **Circle number of literature you want.**
- **Print or type your name, position, company and address.**
- **Clip and mail the Service Card.**

235—Hercules Mill

Designed for fine grinding of phosphate rock and similar materials, Bradley Pulverizer's Hercules pneumatic mill is the only pneumatic roller mill installed at floor level. It produces a uniform finished product from 20–325 mesh and is equipped with non-clogging vibratory feeder. A descriptive catalog is available.

CIRCLE 235 ON SERVICE CARD

236—Cyanamid Defoliants

American Cyanamid defoliants offer a wide margin of safety in dosage when applied to cotton and the nitrogen based materials leave no undesirable or damaging residues. The most widely used is Special Grade, a dust form for use where dews are present to activate the chemical. A soluble form spray defoliant is also available. For complete information

CIRCLE 236 ON SERVICE CARD

237—Richardson Scale Systems

A technical reference on indicating and recording systems for use with hopper scales has been issued by Richardson Scale. It describes the complete weighing, indicating and recording cycle, and one section discusses features such as interlocking switches, partial draft printing, follower dial accuracy and dust control provisions.

CIRCLE 237 ON SERVICE CARD

238—Ammonium Sulfate

Top quality ammonium sulfate, bulk or bagged, in car load lots is available from Republic Steel Corp. They can arrange prompt shipments at regular intervals. For more information

CIRCLE 238 ON SERVICE CARD

239—Zeolex 7

Zeolex 7, a highly sorptive carrier specifically designed for pesticides, dust bases or wettable powders, is available from J. M. Huber. In combination with other low-cost, less absorptive carriers, it provides a range of sorptive capacity to meet the requirements of various pesticides and concentrates with superior suspension in wettable powders. To get a working sample formulators can

CIRCLE 239 ON SERVICE CARD

240—Automation

For a really efficient fertilizer plant you must have automation, instrumentation, centralized control and completely automatic operation, says the Dorr Co. If you are considering a new plant or expansion of present facilities it may pay to check with this organization. The complete story is available in a bulletin.

CIRCLE 240 ON SERVICE CARD

241—Chlorinated Benzenes

A new technical handbook describes Dow chlorinated benzenes. The 12 pages provide descriptions and uses, property and solubility tables, toxicity and handling precautions for monochlorobenzene, O-dichlorobenzene, p-dichlorobenzene and 1, 2, 4-trichlorobenzene.

CIRCLE 241 ON SERVICE CARD

242—Pennsalt Defoliants

Service bulletins on De-Fol-Ate and Endothal defoliants are available from Pennsalt. The first is a chlorate type material readily dissolved in water and available in 100 lb. fibre drums. Endothal liquid is also easily mixed with water and comes in five gallon cans or 54 gallon drums. For more efficient, profitable harvesting, the company suggests you try these products. For the bulletins

CIRCLE 242 ON SERVICE CARD

243—Sprockets & Chain

Latest technical data and prices on Taper-Lock sprockets and Dodge roller chain are included in a compact, four page bulletin. This covers all items in the newly extended Taper-Lock line.

CIRCLE 243 ON SERVICE CARD

244—Colemanite

Colemanite, a natural lime borate, can broaden the base for your sales of borated fertilizers, says Pacific Coast Borax. This is a companion product to Fertilizer Borates featuring slow solubility and it is effective on light textured soils or in areas of high rainfall. It can be used in general purpose and premium grade fertilizers which can be applied at above average rates to cotton and boron-sensitive crops. For more information

CIRCLE 244 ON SERVICE CARD

245—The Art of Spreading

Baughman Mfg. Co. offers a free copy of a new booklet, "The Art of Spreading." Scientific answers to dozens of questions relating to bulk spreading are offered, including data on proper spread patterns.

CIRCLE 245 ON SERVICE CARD

246—Ten to One

Cotton growers using BHC can "spend ten dollars and make a hundred" says Columbia-Southern Chem. in emphasizing that without such treatments one bale out of seven is still destroyed by cotton pests. For information on C/S BHC, technical grade, formulators can

CIRCLE 246 ON SERVICE CARD

247—Martenet Process

Link-Belt Co. is exclusive agent for the Martenet process for production of granulated fertilizers. Formulation of all fertilizer ratios is possible using anhydrous ammonia, ammonium nitrate and other high grade materials. Storage curing of the product is not required. Complete new plants can be designed and installed or existing facilities can be converted. For information

CIRCLE 247 ON SERVICE CARD

248—New Trojan Loadster

A ¾ cu. yd. struck measure loader has been added to the Contractors Machinery Co. line. The LH-50 Trojan Loadster features a direct drive through a torque converter coupling to the transmission, four working speeds plus high speed traveling range and gear type reversing mechanism. For literature and name of nearest dealer

CIRCLE 248 ON SERVICE CARD

249—CCC Diluent

There are many advantages in using CCC diluent, according to the Calcium Carbonate Co., including complete dispersion and compatibility with all common insecticides. It conditions formulations, is consistently free flowing, covers more plants and greater area than diluents of lesser density and it coats with a uniform film. For a free test sample with detailed information and prices, formulators can

CIRCLE 249 ON SERVICE CARD

250—Aldrin for Pest-Fert Mixes

Riverdale Chem. Co. offers carefully prepared aldrin formulations to fertilizer mixers. For those using mechanical mixers and pulverizers, 20 per cent aldrin granules 30/60 mesh can be obtained, or for those with spray application equipment, a 4 lb. per gallon liquid concentrate is produced. To obtain more data

CIRCLE 250 ON SERVICE CARD

How to use the READER SERVICE CARD

- **Circle number of literature you want.**
- **Print or type your name, position, company and address.**
- **Clip and mail the Service Card.**

251—NH_3 Broadcast Units

KBH coulter and press wheel assemblies can convert quickly any model KBH Universal Row Crop NH_3 Applicator to broadcast work. The units, especially designed for pastures and small grains, can also be used for row crops. For more information

CIRCLE 251 ON SERVICE CARD

252—Strobane for Household Pests

Strobane, developed by B. F. Goodrich Chem. Co. for use in liquid and aerosol household sprays, has been extensively tested for toxicity, requires no secondary aromatic solvents, has a pleasant odor, leaves no visible crystalline residue, is easy to formulate, has excellent stability and will not deteriorate in storage. Formulators can obtain samples and technical information.

CIRCLE 252 ON SERVICE CARD

253—New Towing Tractor

The Electric Clarkat has been added to the Clark Equipt. Co. line of electric powered units. Available with 2,400 or 3,000 lb. breakaway drawbar pull the towing tractor is easy to operate and has a simple, automatic magnetic controlled electrical system. For more information

CIRCLE 253 ON SERVICE CARD

254—Nitroparaffins

Commercial Solvents Corp. has released an eight page technical data sheet on the nitroparaffins, covering uses, toxicity, shipping, handling and storage, chemical reactions and shipping containers. Included is data on nitromethane, nitroethane, 1-nitropropane and 2-nitropropane.

CIRCLE 254 ON SERVICE CARD

255—New Fork Lift Trucks

A completely new line of fork lift trucks, the G-52 series, has been introduced by Yale & Towne. The 2,000 to 4,000 lb. gas models are smaller with increased power, maneuverability and versatility and feature a fluid coupling built into the drive wheel. An illustrated brochure is available.

CIRCLE 255 ON SERVICE CARD

256—Insecticidal Solvents

Two highly efficient insecticidal solvents are offered by Richfield Oil Corp. Toxisol A and B can help to cut formulation costs, providing high formulation yield. For prices, tests and specifications

CIRCLE 256 ON SERVICE CARD

257—Custom Formulating

Private Brands, Inc. can blend and ship thousands of gallons of specific formulations in a matter of hours. They provide immediate service on aldrin, 2,4-D, 2,4,5-T, chlordane and DDT formulations and many other farm chemicals. If you sell within the range of the Kansas City market, it may pay to investigate the customs ervices offered by this organization.

CIRCLE 257 ON SERVICE CARD

258—Stop Tramp Iron

A new Dings Perma-Plate magnet in the discharge chute of your bagging mill elevator can stop damage caused by tramp iron. These powerful, non-electric magnets pull out any iron and have a certified strength, guaranteed for life of the units. For a catalog showing the Dings line

CIRCLE 258 ON SERVICE CARD

259—Accurate Scales

Accurate split-second check of both open-end and valve-type bags can be obtained with an Exact Weight scale installed right on your floor-level conveyor line. Every bag is checked, seconds are trimmed off each weighing operation and controlled travel brings the scale indicator quickly to rest. For details

CIRCLE 259 ON SERVICE CARD

Buyers' Guide

Classified Index to Advertisers in 'Farm Chemicals'

ALDRIN

Ashcraft-Wilkinson Co., Atlanta, Ga.
Pittsburgh Coke & Chem. Co., Agr. Chem. Div., Pittsburgh, Pa.
Shell Chemical Co., Agr. Chem. Div., Denver, Colo.

AMMONIA—Anhydrous and Liquor

Commercial Solvents Corporation, New York City
Grand River Chem. Div., Deere & Co., Tulsa, Okla.
Lion Oil Co., El Dorado, Ark.
Nitrogen Div., Allied Chemical & Dye Corp., N.Y.C.
Phillips Chemical Co., Bartlesville, Okla.
Spencer Chemical Co., Kansas City, Mo.

AMMONIUM NITRATE

Ashcraft-Wilkinson Co., Atlanta, Ga.
Commercial Solvents Corporation, New York City
Lion Oil Co., El Dorado, Ark.
Phillips Chemical Co., Bartlesville, Okla.
Spencer Chemical Co., Kansas City, Mo.

AMMONIUM PHOSPHATE

Monsanto Chem. Co., St. Louis, Mo.

AMMONIUM SULFATE

See Sulfate of Ammonia

AMMONIUM SULFATE NITRATE

Baker & Bro., H. J., New York City

BAGS—Multiwall-Paper

International Paper Co., Bagpak Div., N. Y. C.
Hammond Bag & Paper Co., Wellsburg, W. Va.
Hudson Pulp & Paper Corp., N. Y. C.
Kraft Bag Corporation, New York City
Union Bag & Paper Corp., New York City

BAGS—Dealers and Brokers

Ashcraft-Wilkinson Co., Atlanta, Ga.
McIver & Son, Alex. M., Charleston, S. C.

BAG CLOSING MACHINES

International Paper Co., Bagpak Div., N. Y. C.

BAG PRINTING MACHINES

Schmutz Mfg., Louisville, Ky.

BAG FILLING MACHINES

Atlanta Utility Works, The, East Point, Ga.
Stedman Foundry and Machine Co., Aurora, Ind.

BHC AND LINDANE

Ashcraft-Wilkinson Co., Atlanta, Ga..
Diamond Alkali Co., Newark, N. J.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Pittsburgh Coke & Chem. Co., Agr. Chem. Div. Pittsburgh, Pa.

BONE PRODUCTS

American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

BORAX AND BORIC ACID

Woodward & Dickerson, Inc., Philadelphia, Pa.

BROKERS

Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Keim, Samuel D., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BUCKETS—Hoist, Crane, etc.

Hayward Company, The, New York City

CALCIUM ARSENATE

American Agricultural Chemical Co., N. Y. C.

CARS AND CART

Atlanta Utility Works, The, East Point, Ga.
Stedman Foundry and Machine Co., Aurora, Ind.

CASTOR POMACE

Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
McIver & Son, Alex. M., Charleston, S. C.

CHEMISTS AND ASSAYERS

Shuey & Co., Inc., Savannah, Ga.
Wiley & Company, Baltimore, Md.

CHLORDANE

Ashcraft-Wilkinson Co., Atlanta, Ga.
Pittsburgh Coke & Chem. Co., Agr. Chem. Div., Pittsburgh, Pa.

CLAY

Ashcraft-Wilkinson Co., Atlanta, Ga.

CONDITIONERS

Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Jackle, Frank R., New York City
Keim, Samuel D., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
National Lime & Stone Co., Findlay, Ohio

CONVEYORS

Power-Curve Conveyor Co., Denver, Colo.
Link-Belt Co., Chicago, Ill.

COPPER SULFATE

Republic Chemical Corp., New York City
Tennessee Corp., Atlanta, Ga.

COTTONSEED PRODUCTS

Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa

DDT

Ashcraft-Wilkinson Co., Atlanta, Ga.
Diamond Alkali Co., Newark, N. J.
Michigan Chemical Corp., St. Louis, Mich.
Monsanto Chemical Co., St. Louis, Mo.
Pittsburgh Coke & Chem. Co., Agr. Chem. Div., Pittsburgh, Pa.

DIELDRIN

Ashcraft-Wilkinson Co., Atlanta, Ga.
Pittsburgh Coke & Chem. Co., Agr. Chem. Div., Pittsburgh, Pa.
Shell Chem. Corp., Agr. Chem. Div., Denver, Colo.

DILUENTS

Ashcraft-Wilkinson Co., Atlanta, Ga.
Calcium Carbonate Co., Chicago, Ill.
Pioneer Pyrophyllite Producers, Beverly Hills, Calif.
Pittsburgh Coke & Chem. Co., Agr. Chem. Div., Pittsburgh, Pa.
Summit Mining Corporation, Carlisle, Pa.
Thomas Alabama Kaolin Co., Baltimore, Md.

DITHIOCARBAMATES

Berkshire Chemicals, New York City

ELEVATORS

Power-Curve Conveyor Co., Denver, Colo.
Link-Belt Co., Chicago, Ill.
Stedman Foundry and Machine Co., Aurora, Ind.

ENGINEERS—Chemical and Industrial

Chemical Construction Corp., New York City
Fairlie, Inc., Andrew M., New York City
General Industrial Development Corp., N. Y. C.
Marietta Concrete Corporation, Marietta, Ohio
Stedman Foundry and Machine Co., Aurora, Ind.
Titlestad Corporation, Nicolay, New York City

FERTILIZER—Mixed

American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Davison Chemical Co., div. of W. R. Grace & Co., Baltimore, Md
International Min. & Chem. Corp., Chicago, Ill.

FILLERS

Bradley & Baker, N. Y. C.

FISH SCRAP AND OIL

Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

FULLER'S EARTH

Ashcraft-Wilkinson Co., Atlanta, Ga.

FUNGICIDES

American Agricultural Chemical Co., N. Y. C.
Berkshire Chemicals, New York City
Pittsburgh Coke & Chemical Co., Agr. Chem. Div. Pittsburgh, Pa.
Republic Chemical Corp., New York City
Tennessee Corp., Atlanta, Ga.

HERBICIDES

Diamond Alkali Co., Newark, N. J.
Lion Oil Company, El Dorado, Ark.
Monsanto Chemical Co., St. Louis, Mo.
Pittsburgh Coke & Chem. Co., Agr. Chem. Div. Pittsburgh, Pa.

HERBICIDES—Oils

Lion Oil Company, El Dorado, Ark.

HOPPERS & SPOUTS

Atlanta Utility Works, The, East Point, Ga.
Stedman Foundry and Machine Co., Aurora, Ind..

IMPORTERS, EXPORTERS

Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Berkshire Chemicals, New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

INSECTICIDES

American Agricultural Chemical Co., N. Y. C.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Berkshire Chemicals, New York City
Diamond Alkali Co., Newark, N. J.
Michigan Chemical Corp., St. Louis, Mich.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Pittsburgh Coke & Chem. Co., Agr. Chem. Div. Pittsburgh, Pa.
Shell Chem. Corp., Agr. Chem. Div., Denver, Colo.
U. S. Industrial Chemicals Co., New York City

IRON SULFATE

Tennessee Corp., Atlanta, Ga.

KAOLIN

Thomas Alabama Kaolin Co., Baltimore, Md.

LEAD ARSENATE

American Agricultural Chemical Co., N. Y. C.

LIMESTONE

American Agricultural Chemical Co., N. Y. C.
Ashcraft-Wilkinson Co., Atlanta, Ga.
National Lime & Stone Co., Findlay, Ohio

Buyers' Guide

MACHINERY—Acid Making and Handling
Atlanta Utility Works, The, East Point, Ga.
Chemical Construction Corp., New York City
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY—Acidulating
Chemical Construction Corp., New York City

MACHINERY—Grinding and Pulverizing
Atlanta Utility Works, The, East Point, Ga.
Bradley Pulverizer Co., Allentown, Pa.
Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY—Material Handling
Atlanta Utility Works, The, East Point, Ga.
Clark Equipt. Co., Construction Mach. Div., Benton Harbor, Mich.
Hayward Company, The, New York City
Hough, The Frank G. Co., Libertyville, Ill.
Lessman Mfg. Co., Des Moines, Ia.
Link-Belt Co., Chicago, Ill.
Poulsen Co., Los Angeles, Calif.
Power-Curve Conveyor Co., Denver, Colo.
Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY—Mixing, Screening and Bagging
Atlanta Utility Works, The, East Point, Ga.
Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY—Power Transmission
Link-Belt Co., Chicago, Ill.
Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY
Superphosphate Manufacturing
Atlanta Utility Works, The, East Point, Ga.
Link-Belt Co., Chicago, Ill.
Stedman Foundry and Machine Co., Aurora, Ind.

MAGNESIUM SULFATE
Berkshire Chemicals, New York City

MANGANESE SULFATE
Tennessee Corp., Atlanta, Ga.

MANURE SALTS
Potash Co. of America, Washington, D. C.

MINOR ELEMENTS
Tennessee Corporation, Atlanta, Ga.

MIXERS
Atlanta Utility Works, The, East Point, Ga.
Stedman Foundry and Machine Co., Aurora, Ind.

NITRATE OF POTASH
Berkshire Chemicals, New York City

NITRATE OF SODA
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
McIver & Son, Alex. M., Charleston, S. C.
Nitrogen Div., Allied Chemical & Dye Corp., N.Y.C.
International Min. & Chem. Corp., Chicago, Ill.
Woodward & Dickerson, Inc., Philadelphia, Pa.

NITROGEN SOLUTIONS
Commercial Solvents Corporation, New York City
Nitrogen Div., Allied Chemical & Dye Corp., N.Y.C.
Lion Oil Company, El Dorado, Ark.
Phillips Chemical Co., Bartlesville, Okla.
Spencer Chemical Co., Kansas City, Mo.

NITROGEN MATERIALS—Organic
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
Smith Rowland Co., Norfolk, Va.
Woodward & Dickerson, Inc., Philadelphia, Pa.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.
Spraying Systems Co., Bellwood, Ill.

PARATHION
Ashcraft-Wilkinson Co., Atlanta, Ga.
Monsanto Chemical Co., St. Louis, Mo.
Pittsburgh Coke & Chem. Co., Agr. Chem. Div., Pittsburgh, Pa.

PENTACHLOROPHENOL
Monsanto Chemical Co., St. Louis, Mo.

PHOSPHATE ROCK
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

PHOSPHORIC ACID
American Agricultural Chemical Co., N. Y. C.
Monsanto Chemical Co., St. Louis, Mo.

PLANT CONSTRUCTION—Fertilizer and Acid
Atlanta Utility Works, The, East Point, Ga.
Chemical Construction Corp., New York City.
General Industrial Development Corp., N. Y. C.
Link-Belt Co., Chicago, Ill.
Monsanto Chemical Co., St. Louis, Mo.
Stedman Foundry and Machine Co., Aurora, Ind.
Titlestad Corporation Nicolay, New York City

POTASH—Muriate
American Potash & Chemical Corp., N. Y. C.
Ashcraft-Wilkinson Co., (Duval Potash) Atlanta, Ga.
Baker & Bro., H. J., New York City
Bradley & Baker, N. Y. C.
Duval Sulphur & Potash Co., Houston, Tex.
International Min. & Chem. Corp., Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Potash Co. of America, Washington, D. C.
Southwest Potash Corporation, New York City
United States Potash Co., N. Y. C.

POTASH—Sulfate
American Potash & Chemical Corp., N. Y. C.
Baker & Bro., H. J., New York City
International Min. & Chem. Corp., Chicago, Ill.
Potash Co. of America, Washington, D. C.

POTASSIUM PHOSPHATE
Monsanto Chemical Co., St. Louis, Mo.

PRINTING PRESSES—Bag
Schmutz Mfg. Co., Louisville, Ky.

PYROPHYLLITE
Ashcraft-Wilkinson Co., Atlanta, Ga.
Pioneer Pyrophyllite Producers, Beverly Hills, Calif.

REPAIR PARTS AND CASTINGS
Atlanta Utility Works, The, East Point, Ga.
Stedman Foundry and Machine Co., Aurora, Ind.

SCALES—Including Automatic Baggers
Atlanta Utility Works, The, East Point, Ga.
Stedman Foundry and Machine Co., Aurora, Ind.

SCREENS
Atlanta Utility Works, The, East Point, Ga.
Stedman Foundry and Machine Co., Aurora, Ind.

SPRAYS
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Spraying Systems Co., Bellwood, Ill.

STORAGE BUILDINGS
Butler Manufacturing Co., Kansas City, Mo.
Marietta Concrete Corporation, Marietta, Ohio

SULFATE OF AMMONIA
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Lion Oil Co., El Dorado, Ark.
Nitrogen Div., Allied Chemical & Dye Corp., N.Y.C.
Phillips Chemical Co., Bartlesville, Okla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULFATE OF POTASH—MAGNESIA
International Min. & Chem. Corp., Chicago, Ill.

SULFUR
Ashcraft-Wilkinson Co., Atlanta, Ga.
Texas Gulf Sulphur Co., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULFUR—Dusting & Spraying
Ashcraft-Wilkinson Co., Atlanta, Ga.
U. S. Phosphoric Products Div., Tennessee Corp., Tampa, Fla.

SULFURIC ACID
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
Lion Oil Company, El Dorado, Ark.
Monsanto Chemical Co., St. Louis, Mo.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

SUPERPHOSPHATE
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Bradley & Baker, N. Y. C.
Davison Chemical Co., div. of W. R. Grace & Co., Baltimore, Md.
International Min. & Chem. Corp., Chicago, Ill.
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
Baker & Bro., H. J., New York City
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

TALC
Ashcraft-Wilkinson Co., Atlanta, Ga.

TANKAGE
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
Smith-Rowland Co., Norfolk, Va.
Woodward & Dickerson, Inc., Philadelphia, Pa.

TANKS—NH3
Birmingham Tank Co., Birmingham, Ala.

TEPP
Monsanto Chemical Co., St. Louis, Mo.

TOXAPHENE
Ashcraft-Wilkinson Co., Atlanta, Ga.
Pittsburgh Coke & Chem. Co., Agr., Chem. Div., Pittsburgh, Pa.

2, 4-D
Diamond Alkali Co., Newark, N. J.
Monsanto Chemical Co., St. Louis, Mo.
Pittsburgh Coke & Chem. Co., Agr. Chem Div., Pittsburgh, Pa.

2, 4, 5-T
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Monsanto Chemical Co., St. Louis, Mo.
Pittsburgh Coke & Chem. Co., Agr. Chem. Div., Pittsburgh, Pa.

UREA & UREA PRODUCTS
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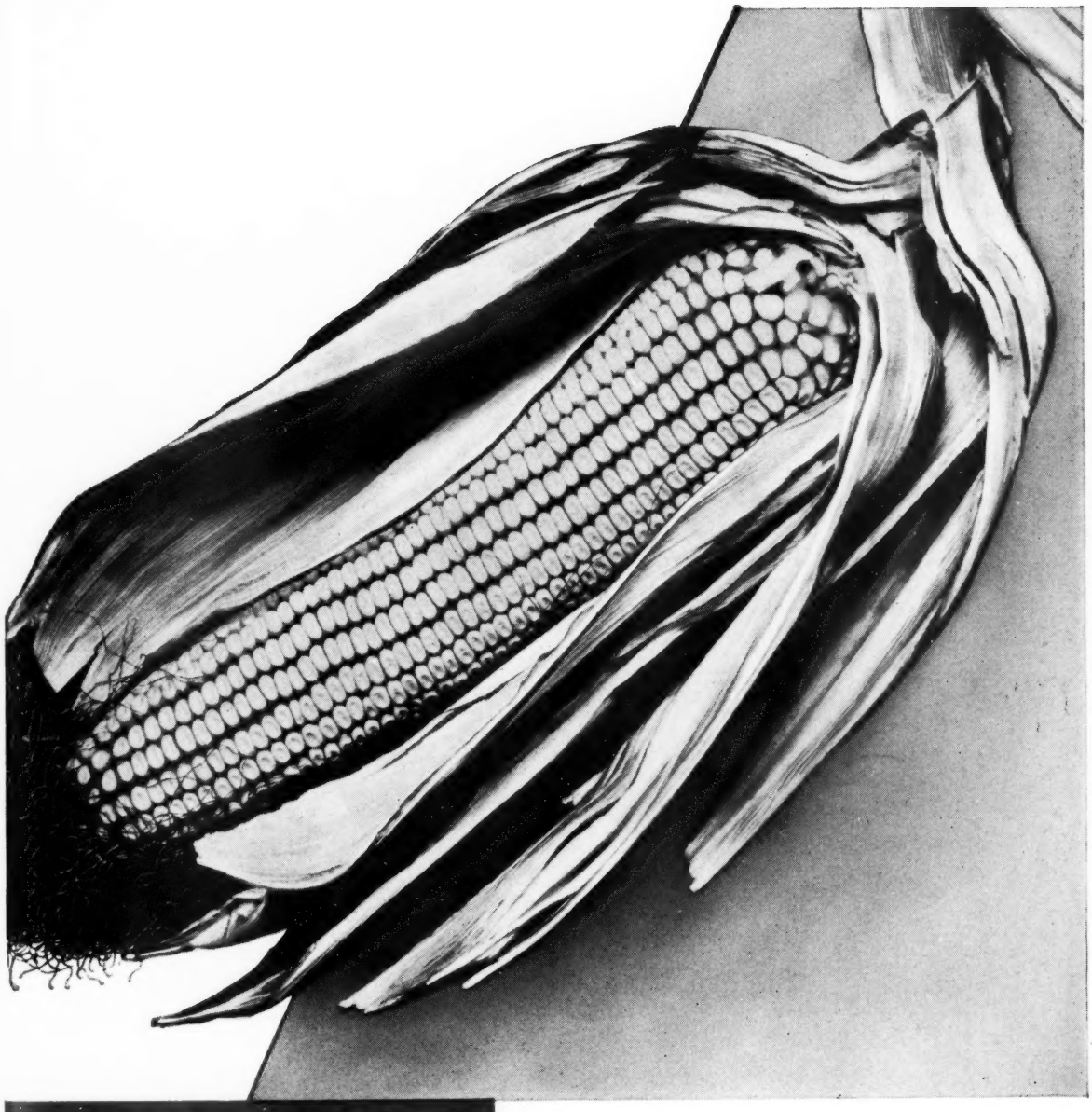
Grand River Chem. Div., Deere & Co., Tulsa, Okla.
Nitrogen Div., Allied Chemical & Dye Corp., N.Y.C

VALVES
Atlanta Utility Works, The, East Point, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

ZINC SULFATE
Tennessee Corp., Atlanta, Ga.



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